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THE VEGETABLE MATERIA MEDICA OF WESTERN INDIA.

BY

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SECOND EDITION, REVISED AND ENLARGED.

برگ درختان سبز در نظر هوشیار
هر ورقي دفتریست معرفت کردگار

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PREFACE TO THE SECOND EDITION.

In preparing a new edition of the "Vegetable Materia Medica of Western India" for the press, the following alterations have been made :—

The botanical nomenclature of the Flora of British India and of Dr. Watt's Catalogue, drawn up for the Calcutta Exhibition of 1883-84, has been adopted instead of that of the Bombay Flora of Dalzell and Gibson.

References to figures of the plants have been inserted.

As it is of considerable interest to compare the Drugs still in use in so conservative a country as India with those of classical Europe, numerous references to Greek and Latin writers have been given. Such additional information concerning the medicinal uses and chemical constitution of Indian Drugs as has become available since the publication of the first edition has been made use of, the whole of the text has been carefully revised, and several articles entirely re-written.

Some Drugs which were omitted in the first edition have been inserted, and some others hitherto unnoticed by European writers have been described.

Several Mahometan works, including Ibn Sina, Ibn Baitar and the Tuhfat-el-Muminin have been carefully re-examined, but little of value has been found in them which is not comprised in the Makhzan-el-Adwiya. This copious treatise on Materia Medica was compiled by Mir Muhammad Husain, a native of Khorasan and pupil of Mir Muhammad Ali-el-Husaini; he resided first in Khorasan, then in Shiraz, and afterwards in India, principally at Murshidabad in Bengal. He tells us in his Preface that in A. H. 1185 (A. D. 1771) he was persuaded to undertake the compilation of a Persian Pharmacopœia, and that when this was completed, he commenced writing the Makhzan-el-Adwiya, or "*Treasury of Medicines*," a work compiled from the most important of the Arabic, Persian and Indian works on Materia Medica, supplemented by his own experience. He also tells us that he gained a knowledge of some new medicines from Europeans; we accordingly find Jalap, Guaiacum, &c., and even such a little known drug at the present time as Mechoacan, or White Jalap, mentioned in his work. There is ample evidence in the Makhzan that he did not accept without enquiry the statements of older writers, as in many places, after stating the generally accepted opinion, he proves it from personal observation to be incorrect. As in all Mahometan works on Medicine and Materia Medica, we find included in his book a number of medicines mentioned by Greek and Latin writers, which are never found in Indian Drug shops, but which, having been mentioned by Hippocrates, Galen, Dioscorides or Avicenna, it would be high treason to discard.

Much interesting information concerning the domestic remedies of the Concan has been gleaned from the Wanaushadi Prakásha of Mr. Wasudeo Chintamon Bapat of Náringré, in the Ratnagherry zillah; this work is especially valuable, as it is evidently, as the author tells us in his Preface, the result of personal observation and enquiry among the aboriginal tribes as well as the Arian population of the Concan and Ghauts of Western India. As might be expected, we find magical effects attributed to plants when used under certain ceremonial conditions, and a strong belief in the doctrine of signatures, superstitions which appear to have prevailed in most countries among wild tribes, and to have survived more or less in spite of civilization. In the Concan, as in other parts of India, the domestic remedies of the Arian population are principally gathered from Sanskrit medical writers, and bear a close resemblance to those of the Greeks.

Since the publication of the first edition of the Materia Medica of Western India, Dr. G. Watt's excellent Catalogue of the Economic Products of India exhibited at the Calcutta International Exhibition of 1883-84, has appeared, and has been freely consulted in the preparation of the second edition.

As an Appendix to the work, an Alphabetical Glossary of the Marathi names of useful plants has been added, in which every endeavour has been made to give the orthography of the words. The names of plants which occur in the literature of the language have been given a place in this list, although their botanical designations may not have been determined. Lastly, the author would wish to acknowledge the valuable assistance he has received from the numerous contributors mentioned in the body of the work, and from Dr. Gray and the late Dr. Sakharam Arjun in the identification of plants growing in the Concan.

PREFACE TO THE FIRST EDITION.

The want of a more exact description of Indian Drugs than is to be found in any work hitherto published, has for a long time attracted the author's attention. This want has to a small extent been met by the description in the Pharmacographia of some thirty-seven Indian Drugs which have been made official in the Pharmacopœia of India, but there still remain undescribed the Drugs comprised in the large secondary list of the latter work, as well as many others in general use among the natives.

The principal objects kept in view by the author whilst writing the following pages have been—

1*st*—To give a short summary when possible of the history and uses of each Drug.

2*nd*—To describe each article with sufficient minuteness to insure the detection of any adulteration.

3*rd*—To draw up a condensed account of what has already been published concerning the chemical composition of the different Drugs.

The commonest native names of the Drugs have been given at the head of each article, and the Sanscrit, Arabic, and Persian names in the Historical Summary. In a work of this kind there must necessarily be many imperfections which can only be remedied by the co-operation of enquirers in different parts of India. The author will gladly receive enquiries, suggestions, and further information.

Drugs, the botanical source of which could not be settled, have been placed in a separate list, but whenever the Natural Order could be determined by inspection, they have been entered in their proper places.

CONTENTS.

PAGE

RANUNCULACEÆ.

Aconitum ferox 1
,, heterophyllum 6
,, species (Bikhma) 9
Delphinium denudatum 11
,, saniculœfolium 14
Nigella sativa 15
Pæonia officinalis 17
Coptis Teeta 18
Thalictrum foliolosum 20
Clematis triloba 21

MAGNOLIACEÆ.

Illicium anisatum 22
Michelia Champaca 23

ANONACEÆ.

Anona squamosa 24

MENISPERMACEÆ.

Jateorhiza Calumba 25
Anamirta Cocculus 27
Cissampelos Pareira 29
Tinospora cordifolia 30
Cocculus villosus 32
,, Leœba 33
Coscinium fenestratum 34

BERBERIDEÆ.

Berberis, several species 35

NYMPHÆACEÆ.

Nelumbium speciosum 37

PAPAVERACEÆ.

Papaver somniferum 39
,, Rhœas 48
Argemone mexicana 50

PAGE

FUMARIACEÆ.

Fumaria officinalis 52
Hypecoum procumbens 54

CRUCIFERÆ.

Anastatica Hierochuntina 54
Lepidium Iberis 55
,, sativum 56
Sisymbrium Irio 57
Brassica nigra 58
,, campestris 58
,, juncea 58
Raphanus sativus 60

CAPPARIDEÆ.

Cleome viscosa 61
Gynandropsis pentaphylla 62
Cratæva religiosa 62
Capparis spinosa 64

VIOLACEÆ.

Viola odorata 65
Ionidium suffruticosum 66

BIXINEÆ.

Gynocardia odorata 67
Hydnocarpus Wightiana 71
Bixa Orellana 73
Cochlospermum Gossypium 73
Flacourtia cataphracta 74

FICOIDEÆ.

Trianthema obcordata 74
Mollugo stricta 75

PORTULACEÆ.

Portulaca oleracea 75
,, quadrifida 75

PAGE

TAMARISCINEÆ.

Tamarix gallica 76
„ articulata 78

GUTTIFERÆ.

Garcinia indica 78
„ xanthochymus 81
„ Mangostana 82
„ Morella 83
Mesua ferrea 84
Ochrocarpus longifolius 85
Calophyllum inophyllum 86
„ Wightianum 87
„ tomentosum 87

DIPTEROCARPEÆ.

Dipterocarpus turbinatus 88
„ incanus 88
„ alatus 88
Shorea robusta 92
Vateria indica 93
Dryobalanops aromatica 93

MALVACEÆ.

Althæa officinalis 96
Malva sylvestris... 98
Sida carpinifolia 99
„ rhombifolia 99
„ cordifolia 99
„ spinosa 99
Abutilon indicum 100
Hibiscus Abelmoschus 102
„ esculentus 103
„ Subdariffa 104
„ cannabinus 104
Thespesia populnea 105
Bombax malabaricum 106
Adansonia digitata 107
Pavonia odorata 109
Gossypium herbaceum 109

STERCULIACEÆ.

Sterculia urens........................ 112
Helicteres Isora 113

PAGE

Pterospermum suberifolium 114
Abroma augusta 114

TILIACEÆ.

Corchorus trilocularis 115
„ fascicularis 115
Grewia tilæfolia 116
„ pilosa.................................. 116

LINEÆ.

Linum usitatissimum 116

ZYGOPHYLLEÆ.

Tribulus terrestris 119
„ alatus 120
Fagonia arabica 120

GERANIACEÆ.

Oxalis corniculata 121

RUTACEÆ.

Ruta graveolens 122
Peganum Harmala 124
Xanthoxylum Rhetsa 127
Toddalia aculeata 129
Murraya Kœnigii 130
Atalantia monophylla 132
Limonia acidissima 132
Paramignya monophylla............ 133
Citrus, several species 134
Ægle Marmelos 139
Feronia elephantum.................. 142

SIMARUBEÆ.

Ailantus excelsa 144
„ malabarica 145
Balanites Roxburghii 146
Samadera indica 147

BURSERACEÆ.

Boswellia, several species 148
„ serrata......................... 152
Balsamodendron species........... 154
Hotai 162
Balsamodendrum Opobalsamum. 164
Garuga pinnata 167
Canarium strictum 167

PAGE

MELIACEÆ.

Melia Azadirachta ... 168
,, Azedarach ... 171
,, dubia ... 173
Naregamia alata ... 174
Turræa villosa ... 175
Soymida febrifuga ... 175
Chloroxylon Swietenia ... 177

CELASTRINEÆ.

Celastrus paniculata ... 178
Elœodendron glaucum ... 179

RHAMNEÆ.

Zizyphus vulgaris ... 180
Rhamnus Wightii ... 181

AMPELIDEÆ.

Vitis quadrangularis ... 182
,, adnata ... 183
,, carnosa ... 183
,, vinifera ... 184
,, araneosus ... 186
Leea robusta ... 186
,, macrophylla ... 187

SAPINDACEÆ.

Cardiospermum Halicacabum ... 187
Sapindus trifoliatus ... 188
Sleichera trijuga ... 190
Dodonæa viscosa ... 191

ANACARDIACEÆ.

Pistacia integerrima ... 191
Rhus coriaria ... 192
Pistacia Terebinthus ... 194
Mangifera indica ... 196
Anacardium occidentale ... 198
Odina Wodier ... 202
Semicarpus Anacardium ... 203
Spondias mangifera ... 205

MORINGEÆ.

Moringa pterygosperma ... 206

CONNARACEÆ.

Rourea santaloides ... 208

PAGE

LEGUMINOSÆ.

Trigonella Fœnum-Græcum ... 209
Melilotus hamosa ... 211
Indigofera tinctoria ... 213
,, enneaphylla ... 215
,, aspalathoides ... 215
,, trifoliata ... 216
Psoralia corylifolia ... 216
Tephrosia purpurea ... 217
Alhagi maurorum ... 218
Uraria picta ... 221
,, lagopoides ... 221
Desmodium gangeticum ... 222
Abrus precatorius ... 223
Mucuna pruriens ... 229
,, monosperma ... 230
Erythrina indica ... 230
Butea frondosa ... 231
,, superba ... 234
Pueraria tuberosa ... 234
Clitorea ternatea ... 235
Dalbergia sympathetica ... 236
Pterocarpus santalinus ... 237
,, Marsupium ... 239
Pongamia glabra ... 243
Glycyrrhiza glabra ... 244
Arachis hypogæa ... 246
Cæsalpinia Bonducella ... 248
,, digyna ... 251
,, Sappan ... 251
Sesbania grandiflora ... 253
,, ægyptiaca ... 254
Cæsalpinia pulcherrina ... 255
Cicer arietinum ... 256
Saraca indica ... 257
Cassia fistula ... 258
,, Sophera ... 260
,, occidentalis ... 262
,, obovata ... 263
,, auriculata ... 264
,, Tora ... 265
,, alata ... 266

PAGE
Cassia Absus 267
,, angustifolia 268
Tamarindus indica 270
Bauhinia variegata 273
,, tomentosa 274
Mimosa pudica 275
Entada scandens 276
Acacia, several species 277
Gums yielded by Indian Acacias. 280
Akakia 281
Acacia arabica 282
,, Catechu 283
,, pennata 285
,, concinna 286
Albizzia amara 287
Hardwickia binata 287
Astragalus sp.? 288
Trachylobium Hornemannianum. 291
Bakila 291
Turmus 292

ROSACEÆ.

Amygdalus communis 292
Prunus bokariensis 294
,, Mahalib 295
,, Pudum 295
Alubalu 296
Hagenia abyssinica 296
Rosa damascena 298
Pyrus Cydonia 302
Potentilla supina 304

LYTHRACEÆ.

Ammania baccifera 304
Woodfordia floribunda 306
Lawsonia alba 307
Punica Granatum 309

HAMAMELIDEÆ.

Liquidambar orientalis 313

COMBRETACEÆ.

Terminalia Chebula 317
,, bellerica 320
,, Catappa 321
PAGE
Terminalia tomentosa 322
,, Arjuna 323
,, paniculata 323
Anogeissus latifolia 324
Quisqualis indica 324

ONAGRACEÆ.

Jussiæa suffruticosa 325

MELASTOMACEÆ.

Memecylon edule 325

MYRTACEÆ.

Barringtonia acutangula 326
Careya arborea 327
Caryophyllus aromaticus 328
Melaleuca leucadendron 331
Eugenia Jambolana 333
Psidium Guyava 334
Myrtus communis 335

CUCURBITACEÆ.

Citrullus Colocynthis 336
Cucumis trigonus 338
Momordica dioica 339
,, Charantia 340
,, Cymbalaria 341
Luffa acutangula 342
,, echinata 343
Trichosanthes cucumerina 343
,, palmata 345
Zehneria umbellata 346
Benincasa cerifera 347
Ampelosicyos scandens 349
Lagenaria vulgaris 349
Citrullus vulgaris 350
Cephalandra indica 351
Ecballium Elaterium 352
Corallocarpus epigæa 353
Bryonia laciniosa 354
Rhynchocarpa fœtida 355

DATISCEÆ.

Datisca cannabina 355

PASSIFLOREÆ.

Carica Papaya 356

PAGE

CRASSULACEÆ.

Bryophyllum calycinum 359
Kalanchoe laciniata 360

UMBELLIFERÆ.

Hydrocotyle asiatica 361
Conium maculatum 363
Carum Carui.......................... 367
,, copticum 365
,, nigrum.......................... 368
Cuminum Cyminum 369
Apium graveolens 370
Fœniculum vulgare................. 372
Anethum graveolens 374
Coriandrum sativum 375
Pimpinella Anisum 377
Carum Roxburghianum........... 378
Prangos pabularia 378
Peucedanum grande.............. .. 379
Daucus Carota 380
Ferula alliacea 381
,, Narthex 385
Scorodosma fœtidum 385
Ferula galbaniflua 390
Dorema Ammoniacum............. 392
,, aureum.......................... 396
Sagapenum 396
Tordylium Secacul 398

CORNACEÆ.

Alangium Lamarckii 399

RUBIACEÆ.

Pavetta indica 400
Pæderia fœtida........................ 400
Morinda citrifolia..................... 401
,, tomentosa 401
Oldenlandia corymbosa 404
,, umbellata........................ 404
Hymenodictyon excelsum 404
Randia uliginosa 406
,, dumetorum 406
Spermacoce hispida.................. 408
Anthocephalus Cadamba 409

PAGE

Canthium parviflorum 409
Ixora coccinea 410
Gardenia lucida 410
,, gummifera 410
Mussænda frondosa 413
Uncaria Gambier...................... 413
Rubia cordifolia 415

VALERIANEÆ.

Nardostachys Jatamansi 417
Valeriana Hardwickii 419

COMPOSITÆ.

Vernonia anthelmintica 421
,, cinerea 423
Elephantopus scaber 423
Lamprachænium microcephalum. 433
Eupatorium Ayapana 424
Spheranthus indicus 426
Blumea sp. 427
Kamafitus 428
Achillæa millefolium 428
,, santolina 429
Erigeron asteroides.................. 429
Ageratum conyzoides 430
Eclipta alba 430
Guizotia abyssynica.................. 432
Glossocardia linearifolia 433
Spilanthes oleracea 434
Grangea Madraspatana 434
Artemisia vulgaris 435
,, Sieversiana 436
,, sternutatoria 437
,, maritima 438
Doronicum pardalianches 442
Anacyclus Pyrethrum 444
Anthemis nobilis 447
Chrysanthemum coronarium...... 448
Pluchea lanceolata 449
Saussurea Lappa 449
Centaurea Behen...................... 456
Xanthium Strumarium 458
Lactuca sativa 459

PAGE
Harshaf 460
Cichorium Intybus 461
Launœa pinnatifida 461
Lactuca remotiflora 462
Notonia grandiflora 463
Carthamus tinctorius 464
Tagetes erecta 466
Carduus nutans 466
Volutarella divaricata 466
Tricholepis glaberrima 467
Dicoma tomentosa 468

LOBELIACEÆ.

Lobelia nicotianæfolia 468

ERICACEÆ.

Gualtheria fragrantissima 469

MYRSINACEÆ.

Embelia Ribes 471

OLEACEÆ.

Nyctanthes Arbor tristis 473
Jasminum grandiflorum 474
„ Sambac 475
„ arborescens 475

SAPOTACEÆ.

Bassia latifolia 476
Mimusops Elengi 480
„ hexandra 482
Achras Sapota 482

EBENACEÆ.

Diospyros Embryopteris 483
Ebony 485

STYRACEÆ.

Styrax Benzoin 485
Symplocos racemosa 489

APOCYNACEÆ.

Alstonia scholaris 491
Rhazya stricta 496
Holarrhena antidysenterica 496
Wrightia tinctoria 500
Nerium odorum 500
Cerbera Thevetia 503
PAGE
Rauwolfia serpentina 505
Allamanda cathartica 507
Carissa Carandas 507
Plumeria acutifolia 508
Cerbera Odollam 508
Vinca pusilla 509
Azima tetracantha 509

ASCLEPIADEÆ.

Hemidesmus indicus 509
Calotropis gigantea 512
„ procera 512
Tylophora asthmatica 519
„ fasiculata 521
Gymnema sylvestre 521
Dœmia extensa 523
Dregea volubilis 524
Asclepias curassavica 524
Holostemma Rheedii 525
Ceropegia bulbosa 526

LOGANIACEÆ.

Strychnos Nux-vomica 526
„ potatorum 532
„ colubrina 533
„ Ignatii 535

GENTIANACEÆ.

Swertia Chirata 536
„ decussata 540
Exacum bicolor 540
Erythræa Roxburghii 541
Enicostema littorale 541
Canscora decussata 542
Gul-i-ghafith 542
Jintiyana 543

BIGNONIACEÆ.

Stereospermum xylocarpum 544
Heterophragma Roxburghii 544
Stereospermum chelonoides 545
„ suaveolens 546
Dolichandrone falcata 546
Oroxylum indicum 547
Crescentia Cujete 548

PAGE

PEDALINEÆ.

Sesamum indicum 549
Pedalium Murex 553
Martynia diandra 555

CONVOLVULACEÆ.

Ipomœa Turpethum 556
,, hederacea 558
,, Quamoclit 561
,, bona nox 561
,, muricata 562
,, biloba 563
Evolvulus alsinoides 564
Ipomœa digitata 564
,, reniformis 566
,, vitifolia 566
Argyreia speciosa 566
Sakmuniya 567
Cuscuta, species 568
,, ,, ... 569
,, reflexa 569
Cressa cretica 569

BORAGINEÆ.

Cordia myxa 570
,, obliqua 570
Echium sp. 571
Rang-i-badshah 573
Heliotropium indicum 574
,, europæum 575
Ehretia buxifolia 576
,, obtusifolia 576
Coldenia procumbens 576

SCROFULARIACEÆ.

Picrorrhiza Kurroa 577
Herpestis Monniera 579
Celsia coromandeliana 580
Antirrhinum, sp.? 483
Schweinfurthia spherocarpa 580
Torenia asiatica 581
Sopubia delphinifolia 581
Lindenbergia urticæfolia 581

PAGE

ACANTHACEÆ.

Andrographis paniculata 582
Adhatoda Vasica 584
Hygrophila spinosa 585
Dædalacanthus roseus 587
Rhinacanthus communis 588
Barleria Prionitis 590
Acanthus ilicifolius 590
Justicia procumbens 591
Strobilanthes ciliatus 591
Ecbolium Linneanum 592
Justicia Gendarussa 592
Blepharis edulis 593

VERBENACEÆ.

Tectona grandis 595
Clerodendron infortunatum 597
,, Siphonanthus 598
,, inerme 598
,, phlomoides 599
Gmelina 599
Lippia nodiflora 599
Vitex Negundo 600
,, sp. 602
Viburnum fœtidum 603
Premna integrifolia 604
Callicarpa lanata 605

LABIATÆ.

Ocimum sanctum 605
,, basilicum 606
,, gratissimum 607
Coleus aromaticus 608
Anisochilus carnosus 609
Pogostemon parviflorus 609
Micromeria capitellata 610
Anisomeles malabarica 610
Salvia plebeia 611
Leonotis nepetæfolia 611
Zufah-i-yabis 612
Badranjboya 613
Mishk-i-taramashia 613
Lallemantia Royleana 614

PAGE
Faranjmishk ... 614
Mentha sylvestris ... 615
Jadeh ... 615
Satar ... 616
Leucas cephalotes ... 617
Mentha canadensis ... 617
Lavandula Stæchas ... 618
Origanum Marjorana ... 618
Hasha ... 619
Farasiyun ... 619

Plumbagineæ.

Plumbago zeylanica ... 620
,, coccinea ... 623
Statice ægyptiaca ... 624

Salvadoraceæ.

Salvadora persica ... 624
,, oleoides ... 626

Solanaceæ.

Datura alba and fastuosa ... 626
Datura, sp. ? ... 628
Hyoscyamus albus and niger ... 629
Nicotiana Tabacum ... 632
Solanum zanthocarpum ... 636
,, indicum ... 637
,, nigrum ... 638
Capsicum annuum ... 640
Physalis minima ... 643
,, indica ... 643
Withania somnifera ... 643
,, coagulans ... 645

Plantaginaceæ.

Plantago ovata ... 648
,, major ... 650

Amarantaceæ.

Achyranthes aspera ... 651
Amarantus spinosus ... 652
Aerua lanata ... 653

Chenopodiaceæ.

Ushnan ... 653
Celosia argentea ... 655
Arthrocnemum indicum ... 655
PAGE

Nyctaginaceæ.

Boerhavia diffusa ... 655
Pisonia morindifolia ... 656
Mirabilis Jalapa ... 657

Polygonaceæ.

Emex, sp. ? ... 657
Rumex vesicarius ... 658
Polygonum glabrum ... 659
,, aviculare ... 659
Rheum sp. ? ... 660
Bijband ... 661

Myristiceæ.

Myristica moschata ... 661
,, malabarica ... 663

Laurineæ.

Cinnamomum Camphora ... 665
,, Cassia ... 667
Kala Nagkesar ... 670
Tejpat *or* Tajpat ... 670
Actinodaphne lanceolata ... 671
Tetranthera laurifolia ... 671
Laurus nobilis ... 672
Cassytha filiformis ... 672

Thymelæaceæ.

Mazariyun ... 673
Lasiosiphon speciosus ... 674
Aquilaria Agallocha ... 674

Aristolochiaceæ.

Aristolochia indica ... 677
,, bracteata ... 679
Zarawand-i-gird ... 680
,, tawil ... 680
Bragantia Wallichii ... 681

Euphorbiaceæ.

Croton oblongifolium ... 682
,, hypoleucos ... 684
,, Tiglium ... 684
Baliospermum montanum ... 688
Macaranga tomentosa ... 689
Euphorbia neriifolia ... 689

PAGE
Euphorbia hirta and thymifolia.. 693
„ parviflora 694
„ Tirucalli 694
Jatropha Curcas 694
„ multifida 697
„ glandulifera.............. 697
„ nana 699
Phyllanthus Emblica 699
„ Niruri and urinaria.. 701
„ madraspatensis 703
„ reticulatus 703
Ricinus communis 704
Phyllanthus rhamnoides 708
Mallotus philippensis 708
Aleurites moluccana 712
Acalypha indica 714
Briedelia montana 716
Crozophora plicata 716
Securinega leucopyrus 717
Tragia cannabina 717
„ involucrata 718

PIPERACEÆ.

Piper nigrum 718
Chavak 721
Pokli-miri 721
Piper longum and officinarum ... 721
„ Cubeba 724
„ Betle 727
Lendi-pipli 728

CUPULIFERÆ.

Quercus infectoria 729
Betula Bhojpattra 730

SALICINEÆ.

Salix caprea 731
„ tetrasperma 732

URTICACEÆ.

Cannabis sativa 732
Ficus religiosa 743
„ glomerata 744
„ cordifolia 744
„ hispida 745
PAGE
Ficus bengalensis 745
„ Carica 745
„ retusa 745
„ asperrima 746
Urostigma volubile 746
Antiaris toxicaria 747
Ulmus integrifolia 748
Celtis dysodoxylon 748
Artocarpus Lakoocha 749
„ integrifolia 749

MYRICACEÆ.

Myrica sapida 749
Casuarina equisetifolia 750

SANTALACEÆ.

Santalum album 751

LORANTHACEÆ.

Kishmish-i-Kawaliyan 754
Bandakpushp 756

CONIFERÆ.

Pinus longifolia 756
„ Deodara 757
Taxus baccata 758
Juniperus communis 762

SCITAMINEÆ.

Zinziber officinale 762
„ Cassumunar 764
Curcuma longa 764
„ angustifolia 768
„ aromatica 769
„ Zedoaria 771
„ cæsia 773
Alpinia officinarum 774
The Great Galangal 777
Musa paradisiaca 777
Costus speciosus 779
Hedychium spicatum 780
Kæmpferia rotunda 785
Elettaria Cardamomum 786
Other kinds of Cardamom 788

PAGE

ORCHIDACEÆ.

Eulophia and Orchis 789
Padshah salep 791
Singh-rukh 791
Vanda Roxburghii 792

IRIDEÆ.

Iris germanica 793
,, species 795
Crocus Sativus 796

PALMÆ.

Cocos nucifera 800
Borassus flabelliformis 801
Phœnix sylvestris 801
Areca Catechu 802
Lodoicea seychellarum 804
Calamus Draco 806
Socotra Dragon's Blood 810

AROIDEÆ.

Pistia Stratiotes 811
Scindapsus pertusus 812
Acorus Calamus 813
Amorphophallus campanulatus ... 815
Synantherias sylvatica 816
Sauromatum pedatum 817
Colocasia antiquorum 817

XYRIDEÆ.

Xyris indica 818

AMARYLLIDEÆ.

Hypoxis orchioides 818
Crinum asiaticum 820
,, ornatum 822

LILIACEÆ.

Aloe abyssinica 823
Socotrine Aloes 825
Yamani or Moka Aloes 826
Urginea indica 829
Asphodelus fistulosus 831
Polianthes tuberosa 832
Gloriosa superba 832
cilla hyac inthoides 834

PAGE

Hermodactylus 835
Substitute 837
Similax China 838
,, ovalifolia 839
Asparagus adscendens 840
,, sarmentosus 840
,, officinalis 841
Thum-el-barri 841

HÆMODORACEÆ.

Sanseviera zeylanica 842

COMMELINACEÆ.

Tradescantia axillaris 842

DIOSCORINEÆ.

Dioscorea sp. var 842

TYPHACEÆ.

Typha angustifolia 843

CYPERACEÆ.

Cyperus rotundus 844
,, pertenuis 845
Scirpus Kysoor 847

GRAMINEÆ.

Andropogon Schœnanthus 847
,, luniger 850
,, muricatus 851
,, citratus 852
,, Nardus 853
Kyllingia monocephala 853
Coix lachryma 853
Poa cynosurioides 854
Zea Mays 855
Manisurus granularis 856
Bambusa arundinacea 856
Sult 859
Shalim 860
Rohish 860

FILICES.

Polypodium vulgare 860
Asplenium sp. 861
Adiantum venustum 861

PAGE
Adiantum lunulatum 861
Actinopteris dichotoma 862
Polypodium quercifolium 863

LICHENES.

Parmelia kamtschadalis 864
„ perlata 864
„ perforata 864

FUNGI.

Polyporus officinalis 865
Agaricus ostreatus 868

ALGÆ.

Sphærococcus compressus 868
PAGE
Gloiopeltis tenax 868
Gelidium cartilagineum 868
„ corneum 868
Gracilaria lichenoides 872
Ulva latissima 874
Porphyra vulgaris 874
Laminaria saccharina 874
Chondrus crispus........................ 874
Husn-i-yusuf............................. 875
APPENDIX 876
MARATHI GLOSSARY 894
INDEX....................................... 953

Corrigenda

Page 6, 9th line from bottom, for *Benth.* read *Bentl.*
„ 11, 20th „ „ „ *for* **Delphinimum** *read* **Delphinium.**
„ 21, 4th „ „ „ *for* χλημaτις *read* κλημaτις.
„ 23, 10th „ „ „ *for* champaca *read* Champaca.
„ 25, 17th „ „ „ *for* calumba *read* Calumba.
„ 27, 13th „ „ top, *for* cocculus *read* Cocculus.
„ 35, 3rd „ „ bottom, *for* λυχιον *read* λυκιον.
„ 54, 14th „ „ „ *for* hierochuntina *read* Hierochuntina.
„ 55, 16th „ „ „ *for* iberis *read* Iberis.
„ 57, 6th „ „ „ *for* is *read* was once.
„ 73, 6th „ „ top, *for* orellana *read* Orellana.
„ 78, 5th „ „ bottom, *for* Indica *read* indica.
„ 93, 7th „ „ top, *for* Indica *read* indica.
„ 104, 11th „ „ „ *for* subdariffa *read* Subdariffa.
„ 124, 13th „ „ „ *for* nitric *read* rutic.
„ 139, 11th „ „ bottom, *for* marmelos *read* Marmelos.
„ 171, 4th „ „ „ *for* azedarach *read* Azedarach.
„ 177, 9th „ „ „ *for* swietenia *read* Swietenia.
„ 196, 16th „ „ top, *for* Indica *read* indica.
„ 239, 8th „ „ bottom, *for* marsupium *read* Marsupium.
„ 251, 10th „ „ top, *for* sappan *read* Sappan.
„ 260, 16th „ „ bottom, *for* sophera *read* Sophera.
„ 265, 8th „ „ top, *for* tora *read* Tora.
„ 267, 9th „ „ „ *for* absus *read* Absus.
„ 296, 8th „ „ bottom, *for* Abyssinica *read* abyssinica.
„ 298, 1st „ „ top, *for* Damascena *read* damascena.

Page	302,	11th	line	from	top	*for* cydonia *read* Cydonia.
,,	309,	5th	,,	,,	,,	*for* granatum *read* Granatum.
,,	317,	12th	,,	,,	,,	*for* chebula *read* Chebula.
,,	321,	5th	,,	,,	bottom,	*for* catappa *read* Catappa.
,,	324,	15th	,,	,,	,,	*for* Indica *read* indica.
,,	333,	1st	,,	,,	top,	*for* jambolana *read* Jambolana.
,,	336,	4th	,,	,,	,,	*for* colocynthis *read* Colocynthis.
,,	340,	6th	,,	,,	,,	*for* charantia *read* Charantia.
,,	352,	1st	,,	,,	,,	*for* elaterium *read* Elaterium.
,,	356,	15th	,,	,,	,,	*for* papaya *read* Papaya.
,,	367,	12th	,,	,,	,,	*for* carui *read* Carui.
,,	369,	1st	,,	,,	,,	*for* cyminum *read* Cyminum.
,,	377,	1st	,,	,,	,,	*for* anisum *read* Anisum.
,,	385,	5th	,,	,,	bottom,	*for* narthex *read* Narthex.
,,	400,	1st	,,	,,	top	*for* Indica *read* indica.
,,	434,	9th	,,	,,	bottom	*for* madraspatana *read* Madraspatana.
,,	471,	10th	,,	,,	top,	*for* ribes *read* Ribes.
,,	473,	2nd	,,	,,	,,	*for* arbor tristis *read* Arbor-tristis.
,,	475,	4th	,,	,,	,,	*for* sambac *read* Sambac.
,,	503,	16th	,,	,,	,,	*for* thevetia *read* Thevetia.
,,	507,	17th	,,	,,	bottom,	*for* corandas *read* Carandas.
,,	509,	6th	,,	,,	,,	*for* Heimdesmus *read* Hemidesmus.
,,	553,	16th	,,	,,	,,	*for* murex *read* Murex.
,,	811,	7th	,,	,,	,,	*for* stratiotes *read* Stratiotes.
,,	868,	1st	,,	,,	top	*for* Agaricus ostreatus, *Jacq.* *read* Polyporus sp. ?
,,	877,	15th	,,	,,	bottom	*for* Kanturiyum *read* Kanturiyun.
,,	905,	11th	,,	,,	top	*for* A creeper, Bot. name ? *read* Rhizophora mucronata, *Lam.*

List of Corrigenda in Part I.

Page 6, 9th line from bottom, for *Benth.* read *Bentl.*

„ 11, 14th line from top, for **Delphinimum** read **Delphinium.**

„ 21, 4th line from bottom, for χλημaτίς read κλημaτίς.

„ 35, 3rd line from bottom, for λύχιον read λύκιον.

THE
VEGETABLE MATERIA MEDICA
OF
WESTERN INDIA.

RANUNCULACEÆ.

Aconitum ferox, *Wallich, Bentl. and Trim., t.* 5, and one or more other species of poisonous Aconite growing in Northern India. The tubers.

Vernacular.—Bish or Bikh, derived from the Sanskrit Visha, Bachnág (*Hind.*), Bachnáb (*Bomb.*), Vashanaví (*Tam.*), from Sanskrit Vatsanábha.

History, Uses, &c.—The greater part of the drug is generally supposed to be derived from A. ferox, but we have no very exact information upon this point (confer. Pharmacographia, p. 12).

Hindu writers mention no less than eighteen kinds of Bish or poison, of which ten are said to be unfit for medicinal use on account of their extremely poisonous properties, which they exaggerate to such an extent as to say that their touch is fatal; of the eight kinds which may be used, that known as Teliya Bachnág is said to be the best; it is of a yellowish brown colour, and in shape like a deer's horn. Bish as a name for Aconite appears to have been known to the Hindus from the earliest ages, but the word appears to have been applied also to any very poisonous root. The nine virulent poisons mentioned by Sanskrit writers are certainly not all Aconites, as some of them are described as growing in parts of India in which Aconites are not found; thus it would appear that the Sanskrit Visha, and its equivalents, Bish and Bikh,[*] in the modern Indian languages, may be understood to mean poison, and especially Aconite as being the most virulent poison known. The non-poisonous Aconites, which are known and used as medicines, have distinct vernacular names. The author of the Makhzan-el-Adwiya and other Arabian and Persian writers describe Bish as an Indian root, and appear to have copied their accounts of it from Hindu books; there is some difference of opinion as regards its properties, some considering it to be cold in the fourth degree, and others hot and dry; the latter opinion seems to prevail, as the drug is recommended in diseases arising from cold humors and atrabilis, and also in leprosy, cough, asthma and ulceration of the throat.[†] Bish is much used as an external application, the root being formed into a paste (*lép*) and spread upon the skin as a remedy for neuralgia and other painful affections, such as boils, &c.; internally it is prescribed in fever and rheumatism, but is generally mixed with a number of other drugs, both mineral and vegetable; moreover, it undergoes a process of purification by being boiled in milk or cow's urine, which must considerably diminish its activity. European physicians in India have long been in the habit of using Bish as a substitute for ordinary Aconite root, and it has of late years been used in Europe as a source of Aconitine, or rather Veratroyl-aconine.

Description.—The fresh root of A. ferox has been described by Balfour (Edinb. New Phil. Journal, xlvii., 1849,) from a plant grown in the Edinburgh Botanical Gardens, as having 2-3 fasciculated, fusiform attenuated tubers, some nearly five inches long and 1½ inch in circumference, dark brown externally, white within, sending off sparse longish branching fibres. Two kinds of the dried root (Bachnáb) are met with in the Bombay market. That in general use consists of black, plump heavy conical tubers, many of them four inches long, having a strong disagreeable smell like Hyraceum, and a reddish brown resinous fracture in dry weather, in the rainy season they become tough, horny and moist, and stain the fingers brown when handled. This kind, even when carefully washed, retains its strong smell, which renders it unfit for medicinal use among Europeans. The other kind, called here White or Lahore Batchnáb, is only to be obtained in small quantities, unless specially ordered; it exactly corresponds with the description of the Bish imported into England as given in the Pharmacographia. It may have a horny or starchy fracture; in the former case it is more or less shrivelled, from having been exposed to heat, and the starch granules, if examined, will be found altered.

[†] In Northern India ष is pronounced kh, in Southern India sh.

[*] In Paris public singers employ with success the alcoolature d'aconit in doses of 10 to 20 drops in a glass of eau sucrée, of which a mouthful is taken occasionally to clear the voice.—(Dorvault.)

Microscopic structure.—If we examine a transverse section of a tuber which has not been subjected to heat, commencing from the circumference, we see an external brown epidermis composed of compressed cells, among which are some stone cells; next we come to a homogeneous white or yellowish starchy parenchyme, and at a certain distance from the circumference five to six or seven brown vascular bundles, connected together by a brown line composed of a zone of small stone cells; inside this we meet again with a starchy parenchyme; the centre of the tuber is often fissured. In young roots the vascular bundles are nearer the centre than in old ones.

Chemical composition.—For a full account of this, consult Pharmacographia, p. 9; Dragendorff Beitrage z gerichtl, Chem., p. 57-72; Fluckiger Archiv. f. Pharm. B. 191, p. 196; Grove's Phar. Jour. and Trans. 1873-74, p. 293; Report on Aconite Alkaloids, by Dr. Alder Wright, Year Book of Pharm., 1881, p. 27; Dragendorff Analyse chimique de quelques drogues actives, traduit par Morel, p. 13. The following extract is made from the last named work:—

"The tubers known as Bish, which have for some time been met with in commerce, contain an alkaloid, which, in its chemical reactions, presents a close analogy with Aconitine, but which differs from that alkaloid at least quantitatively in solubility and physiological action (confer Ewers, Ueber die physiol

Wirkung des aus Aconit. ferox dargestellten Aconitine, Diss. Dorpat, 1873). We cannot, then, consider these two products to be identical. I find that the alkaloid of Bish, which has been called Nepaline and pseudo-Aconitine, can be quantitatively determined by the same process as Aconitine, and that it gives the same reactions as that alkaloid. Besides the more acrid qualities and greater activity of Nepaline, I may mention as a distinguishing character of this alkaloid, its greater solubility in boiling water and its being less soluble in ether and chloroform. I may, perhaps, also mention that unlike the Aconitine of Duquesnel, Nepaline prepared by the same process is not precipitated by Chloride of Platinum. Nepaline can be estimated by means of Mayer's solution, one cc. corresponding to 0·0388 grammes of the alkaloid; I have obtained from farinaceous Bish extracted by water 1·81 and 1·82% and extracted by alcohol 1·15 and 1·04% of Nepaline. If the action of the alcohol is prolonged for several days, a better result is obtained."

One litre of Mayer's solution contains 13·546 grm. of Perchloride of Mercury and 49·8 of Iodide of Potassium. Its action is based upon the formation of a double iodide of the alkaloid very sparingly soluble in water, and composed of 1 eq. of Iodide of Aconitine and 1 eq. of Biniodide of Mercury.

F. Mandelin (*Archiv. der Pharm., February and March,* 1885,) gives the following as the conclusions he arrives at after a thorough investigation of the subject of aconitine :—

1. Japaconitine is identical with aconitine, and both are identical with a crystalline benzoylaconine.

2. Benzoylaconine is the only active principle of *Aconitum napellus,* the other alkaloids contained in the plant being amorphous and pharmacologically unimportant.

3. The active principle of the roots of *Aconitum ferox* is however pseudo-aconitine or veratroylaconine.

4. Aconitine and pseudo-aconitine are pharmacologically identical, but in consequence of its molecule being larger, more veratroylaconine is required to produce the same effects as aconitine or pseudo-aconitine.

5. The difference in the toxicological effects of *Aconitum napellus* and *Aconitum ferox* depends entirely upon the relative amount of aconitine contained in the two plants respectively, and not, as hitherto supposed, upon any difference in the virulence of the active principle of either of them.

6. Aconitine and pseudo-aconitine are the strongest known poisons.

7. The maximum dose to be given at one time would be 0·1 m. g. or 0·5 m. g. per diem. Subcutaneously the dose should be less.

8. Aconine and pseudo-aconine, which are probably either identical or homologous, are likewise poisonous, but far less so than their mother alkaloids.

9. Benzoylaconine and veratroylaconine show an interesting chemical and pharmacological analogy to the alkaloids of the atropine group.

10. The aconitine of commerce is either benzoylaconine or veratroylaconine in a greater or less degree of purity; the German and French preparations being benzoylaconine, the English (especially Morson's) veratroylaconine.

11. The cause of the difference in the physiological effects of the various aconitines of commerce depends chiefly upon the relative amount of alkaloidal products of decomposition (aconine or pseudo-aconine) which they contain, and which do not occur only as such, but also in the form of intermediate products of decomposition of aconitine (amorphous alkaloids).

12. Pure aconitine should yield a *colourless* solution with concentrated sulphuric acid, should not turn red on the addition of one or two drops of a concentrated solution of sugar; the yellow precipitate, formed by adding phosphomolybdic acid to solutions of aconitine, should dissolve in a few drops of ammonia without any blue coloration.

13. Pure aconitine yields no colour reactions, and those formerly suggested were due to impurities.

14. Hübschmann's napelline is no distinct alkaloid, but a variable mixture of aconitine and aconine.

15. Acolyctine and lycoctonine are not identical with aconine (pseudo-aconine).

16. Aconitine and pseudo-aconitine do not split up in the animal organism, absorption and ejection taking place very quickly.

17. Owing to its virulence, its ready decomposition, and the absence of delicate characteristic tests, the post-mortem detection of aconitine as such is very difficult, the symptoms and the condition of the internal organs are chiefly to be relied upon. (See *Chemist and Druggist,* April 1885, p. 223.)

Commerce.—Aconite root (Bachnág) is imported into Bombay from Northern India; the black strong smelling kind is almost exclusively used in this part of the country. Its average price is 9—10 annas a pound.

White Bachnág can be obtained for the same price from Calcutta. Other vernacular names for it are Mithabish, Sringibish and Dagra.

In the Southern Concan Lagenandra toxicaria is known as Vatsanábh.

Some parcels of Aconite root met with in the Bombay market are composed of much smaller tubers than those usually seen, and are evidently obtained from a different plant than A. ferox, probably from A. napellus; they have the usual strong hyraceum odour.*

Aconitum heterophyllum, *Wallich., Benth. and Trim., t.* 7. The tubers.

Vernacular.—Atís, (*Hind.*), Ativish (*Mar.*), Ati-vadayam (*Tam.*), Ataicha (*Sans.*)

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* The Aconite of the Greeks and Roman, the *ἀκόνιτον ετέρον* of Dioscorides is generally considered to be A. napellus; it is the Khanik-el-zeib and Khánik-el-namir of the Arabians. Ibn Sina says in the Kânun that it kills wild pig, dogs, tigers and panthers, and is not used medicinally. (Conf. Dioscorides iv. 76; Plin 27, 3.)

History, Uses, &c.—The earliest notices of this drug are to be found in Hindu works on Materia Medica, Sárangadhara and Chakradatta, where it is recommended as a remedy in fevers, diarrhœa, dyspepsia and cough, also as an alexipharmic; those in Arabic and Persian works are short, and apparently copied from them; they direct it to be prescribed in combination with aromatics, astringents and sometimes with other bitters, such as Bonduc-nuts, Tinospora, Holarrhena, &c. The author of the Makhzan-el-Adwiya calls it an Indian root, resembling a small specimen of Aristolochia longa, and says that some authorities describe three kinds, viz., Atís, Part-bikhta, and Shámkand; but others only two kinds—white and black. He says it is aphrodisiacal and tonic, checks diarrhœa, and removes corrupt bile and cold humors and the diseases arising from them.

The early English physicians in India appear to have been chiefly impressed with its antiperiodic and tonic action in fevers, and the drug has until quite a recent date been much administered as an antiperiodic in doses of about 30 grains every four or six hours. The discovery that the active principle, Atisine, is only present in very small quantities in Atís, seems to have brought the drug into discredit, and the European demand for it has much fallen off. A few years ago 100 lbs. were issued annually from the Government Store Depôt at Bombay; last year (1884) only 17 lbs. were required. The evidence collected by Dr. G. Watt for his Dictionary of the Economic Products of India also indicates that Atís is now considered an indifferent antiperiodic by many medical men. Dr. M. Sheriff considers that the ordinary doses are only useful as a tonic, and that two drams or more should be given as an antiperiodic. Probably the native estimate of the drug, as given above from the Makhzan, is not far from the truth. A. heterophyllum grows along the Himalayan range at elevations of from 8,000 to 13,000 feet, extending as far west as the Indus.

Description.—The drug, when it arrives in Bombay, may be divided into two portions, grey and white; the grey shrivelled tubers, which are larger and longer than the white, are the mother roots, and are often separated and sold at a lower price. The young daughter-tubers should be quite plump, externally of a pale ash color, slightly scarred from the abrasion of rootlets, from ¾ to 2 inches long, obconical, or almost ovoid, with a thin tap-like extremity, which is sometimes double, or has a tendency to divide; at the summit there is a scaly leaf-bud. Atís should break with a short starchy fracture, presenting a white surface, near the circumference of which several vascular bundles are observable with the naked eye; it should taste purely bitter, and have no particular odour.

Microscopic structure.—The tubers consist of a delicate cellular parenchyme filled with starch, in which are to be observed about four vascular bundles, which, in the young tuber, are near the centre, but subsequently are removed towards the circumference. The epidermis consists of light brown tabular cells; the brown zone seen in Aconite is not present.

Chemical composition.—The authors of the Pharmacographia, upon the authority of Broughton, state that the root contains a well-defined alkaloid of intensely bitter taste, Formula $C^{46} H^{74} N^{2} O^{5}$ obtained from concurrent analyses of a platinum salt. Wright (1878) percolated the powdered dry root with alcohol containing a little tartaric acid, and evaporating the percolate he obtained ultimately Broughton's alkaloid *atisine.* This was uncrystallizable, but with hydrochloric acid and gold chloride, he obtained a crystalline hydrodichloride, $C_{22} H_{31} NO_2 HCl, AuCl_3$, from which he suggests that $C_{22} H_{31} NO_2$ may prove nearer the correct formula for Atisine than that given by Broughton. Atís has recently (1879) been examined chemically by Wasowicz. The general results of his investigation are: that he found the root to contain—(1) a fat of soft consistence, probably a mixture of oleic, palmitic, and stearic glycerides; (2) aconitic acid; (3) an acid related to ordinary tannic acid; (4) cane-sugar; (5) vegetable mucilage; (6) pectous substances; (7) atisine, the alkaloid already observed by Broughton, and probably another uncrystallizable alkaloid; (8) starch. The root contained 2·331 per cent. of ash that dissolved partly in water and partially in dilute hydrochloric acid. Experiments made in administering the alkaloid to rabbits show that it is not poisonous. The quantity in the root is exceedingly small ($\frac{6}{100}$ of 1°/.). The purified alkaloid is white and uncrystallizable ; of its salts, only the hydrochlorate, hydrobromate and hydriodate are crystallizable (confer. Archiv der Pharmacie, Vol. XI., p. 19).

Commerce.—Atís comes to Bombay principally through Marwar; it would appear that in some parts of India other roots are sold as Atís (confer. Pharmacographia, p. 15). This is not the case in Bombay. The average price is Rupee ¾ to 1 per lb.

Aconitum Sp. The tubers.

Vernacular.—Bikhma, Bishma (*Hind.* and *Sans.*), Wakhma (*Bomb.*)

History, Uses, &c.—The word Bikhma or Bishma means in Sanskrit like Bish. It is impossible to trace the history of this drug in Arabic and Persian works on Materia Medica, though doubtless it is one of their non-poisonous kinds of Bish, or Jadwár. The author of the Makhzan-el-Adwiya notices it as a non-poisonous kind of Bish, and says it may be prescribed in the same manner as Atís. In English works upon Indian drugs, it appears to have almost escaped attention. Royle refers it to A. palmatum. Dr. Buchanan, in his account of the Kingdom of Nepal, enumerates four kinds of Bikh, of which Bikhma is one ; he describes it as a powerful bitter. Wakhma is a rare drug in Bombay. I never met with it until quite recently; but, upon enquiry, I find that it has generally been obtainable at one or two shops ; it is intensely bitter like quinine, and is administered by Native doctors in combination with black pepper, or mace, in doses of about eight grains, as a remedy for pains in the bowels, diarrhœa, and vomiting ; also to destroy intestinal worms and to remove costiveness.

Externally it is applied in rheumatism. From its sensible properties we may conclude that it would be likely to prove a valuable antiperiodic and tonic ; but, unless it is much more powerful than Atís, its high price will prevent its general use.

Description.— Tuberous roots of a light brown colour, 2 to 4 inches long, much resembling some samples of horny and farinaceous Bish in structure, *but differing from them in being branched.* The tubers break with a short fracture, and the inner substance is either white and farinaceous, or horny and yellowish; both kinds of tuber have a pure persistent bitter taste and no acridity; the horny tubers when moistened develope a pungent smell like nasturtium.

Mocroscopic structure.—The tuber is composed of a starchy parenchyme, with from 6—12 bundles of scalariform vessels; in young roots these are crowded together towards the centre, but in more mature ones they are nearer the circumference; there is no brown zone connecting the vascular bundles.

Chemical composition.—Bikhma has been examined in Prof. Flückiger's laboratory by Mr. Yünichiro Shimoyama, who reports as follows :—" Ten parts of the powdered tubers with one part of slaked lime and about 100 parts of water were dried. The dried powder was repeatedly extracted by a sufficient quantity of strong alcohol, and the latter removed by distillation, to the residue a little acetic acid and water was added to get rid of resinous matters. The filtrate was further purified by means of ether, and the alkaloid precipitated from the acetic solution by adding caustic lye. By repeating the same treatment the alkaloid was at last obtained as a perfectly white amorphous powder of decidedly alkaline reaction, and a very persistent purely bitter taste. The alkaloid dissolved in excess of hydrochloric acid yielded needle-shaped crystals of the hydrochlorate, which were not produced when a neutral solution was used. The hydriodate was also found to be crystallizable, but not the picrate, chromate, or iodohydrargyrate. The aqueous solutions of the alkaloid were precipitated by bichloride of mercury and by tannic acid, not by iodide of potassium. The alkaloid was found to be readily soluble in alcohol, chloroform, bisulphide of carbon, benzol and ether, but none of these solutions afforded crystals ; it was dissolved by concentrated sulphuric acid, and the yellowish solution gradually assumed a splendid purple colour, lasting for a day or more ; it turned violet on addition of a few drops of water. If the alkaloid is evaporated at 100° C. with phosphoric acid, a fine violet hue is also produced."

Prof. Flückiger remarks:—"The alkaloid which Wasowicz extracted from A. heterophyllum in my laboratory is the same as that yielded by the Wakhma tubers."

Commerce—Bikhma is brought in small parcels from some country north of Bombay. Value, Rs. 2 to Rs. 6 per lb., according to the quantity in the market.

Delphinimum denudatum, *Wall. Syn. D. pauciflorum, Royle Ill.* 55. The tubers.

Vernacular.—Jadwár, Mahferfin (*Arab.*), Zadwár (*Pers.*), Nirbishi (*Hind.*)

History, Uses, &c.— The history of this drug is beset with many difficulties, on account of the vague meaning of the term Jadwár; the name by which it is generally known, and which appears properly to mean zedoary. Under Jadwár, the author of the Makhzan-el-Adwiya gives Antila as the Arabic name, and Sáturyús* as the Greek. Speaking of Bish he says that the Hindus suppose that the only plant which can grow near it is the Jadwár, which is an antidote to it, and that they also affirm that there is a kind of rat, called 'Bish mush bisha,' which lives upon Jadwár, and is an antidote to Bish ; this is the Búka Bish Mush of Ibn Sina. The Indian name Nirbishi he explains incorrectly as Nir, the antidote to, Bish, the poison*; he describes five kinds:—

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* Dioscorides describes two kinds of *σατὺριον* (III. 134-135), both reputed to be aphrodisiacal ; see also Pliny on Satyrion (26, 10). Apuleius Platonicus says of Satyrion : Alii cinos, alii panion, Galli via, a Gracis satyrion, alii ennaticon, alii Serpinon, Itali priapiscum, Ægyptus orcisalitexion, alii eriton, alii mene, alii torminalis.

"1*st*—Khatai, black externally, purplish brown internally, scorpioid, knotted, tasting sweetish at first, afterwards very bitter.

2*nd*—Outside and inside brown, or yellowish brown.

3*rd*—Outside and inside black; when rubbed down it has a purplish tinge, bitter. This and the second kind come from Thibet, Nipál, Morang and Rangpore.

4*th*—Blackish, bitter, size of an olive, comes from the Deccan hills.

5*th*—Spanish, called Antila, black, soft, very bitter. Of these the "first kind is said to be most esteemed." It would appear, then, that the term Jadwár has at different times been applied to various tuberous roots supposed to have alexipharmic properties, and that in India it is, at present, applied to the root of a Delphinium, known to the Hindus as Nirbishi, a term which, like Jadwár, has at different times been applied to very different plants. Royle tells us that the best Nirbisi is brought down from Bissehar and Amritsar, and is fusiform, and resembles Bikh, when cut it is of a brownish colour and slightly bitter and acrid. Ulasr Muharrir says that false Jadwár is prepared by boiling the roots of some of the milder kinds of Bish in milk, and colouring them; it is to be distinguished from genuine by its parting with its colour when dipped in warm water and wiped with a cloth; it has also a shrivelled appearance, and the central portion to which the colour has not penetrated is pale; instead of being intensely bitter, it is slightly acrid.

Native Medical works abound in absurd stories concerning this article, and its wonderful power as a tonic and alexipharmic; it fetches a high price, and is generally kept in metallic mercury to prevent its being injured by worms; sometimes it is preserved in oil. The Gedwár figured in Clusius' Exotica, p. 378, appears to be the tuber of a Curcuma.

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* Nirvisha is a Sanskrit adjective meaning "not poisonous," and nirvishâ or nirvishi is never applied to aconite by Hindu medical writers, but denotes a peculiar grass, used as an antidote to certain poisons, namely Kyllingia monocephala, Linn.

Description.—What is considered to be genuine Jadwár in Bombay consists of small blackish-brown tubers, some irregularly ovoid, some conical, seldom more than one inch long and half an inch in diameter ; they are somewhat wrinkled, and bear a few horn-like projections, which are the remains of rootlets ; at the crown there is a scaly leaf bud. When in good condition the tubers are softish, and cut like a piece of dry liquorice extract, the colour being a uniform dark brown throughout ; to the naked eye the cut surface appears structureless, and might be mistaken for an extract ; it has a somewhat fruity smell and bitter taste.

Microscopic structure.—A transverse section shows a dark brown epidermis, composed of compressed cells, an outer ring of parenchyme, the cells of which contain starch granules and much brown granular matter ; within this are from 5 to 10 vascular bundles, connected together by a cambial zone, made up of several rows of small, dark brown cells ; the position of the bundles is very irregular, consequently the zone has a peculiar waving course. In the central portion of the tuber starchy parenchyme is again met with ; the starch has not been altered by heat. It appears to resemble much the Tien-hiung of the Chinese, which is said by Dr. Porter Smith to be derived from Aconitum variegatum. Like Jadwár, this drug is blackish-brown internally, and more or less moist, having evidently undergone some kind of preparation.

Chemical composition.—Twelve ounces of the roots treated by Dragendorff's process for Aconitine, yielded no trace of alkaloid upon evaporation of the benzine solution. The treatment of the drug by acidulated water extracted a large quantity of black extractive which was almost entirely soluble in alcohol. It seems probable that the roots undergo some form of preparation during which they are charged with foreign extractive matters.

Delphinium saniculœfolium, *Boiss. Fl. Orient.* I., 91. The herb.

Vernacular.—Zarír (*Arab.*), Asfrak, Asperag, Trayamán (*Pers.*), Trayamán, Gul-jalil (*Bomb.*), Gáfiz, (*Punj.*)

History, Uses, &c.—The author of the Makhzan-el-Adwiya says:—"Zarír grows in the Khorján hills, and is called Asfrak by the people of Shiráz, and Arjikan by the Greeks; the stem is about a span high, flowers yellow, like those of Asfar-i-barri, surrounded by a few soft prickles, leaves yellowish, small, root more than a span long. Asfrak is cold and dry with slight heating properties; also detergent, anodyne and diuretic; it is useful in spleen, jaundice and dropsy; mixed with barley meal, it forms a poultice, which is of much service in inflammatory swellings; its ashes are useful in itch, maximum dose 5 dirhems*; it is also used as a yellow dye." In Bombay it is chiefly used for dyeing silk. Edgeworth brought this drug to notice many years ago, and supposed it to be derived from D. altissimum.

Description.—The drug consists of the flowers, leaves, flower stalks and a small proportion of the immature fruit, all of a light greenish yellow colour, and having a somewhat honey-like smell; the flowers are pubescent; many of them tolerably perfect, resembling in size and shape those of the common single Larkspur; the fruit consists of three follicles, which are arranged like those of the aconite and dehisce; on the inside they are marked with prominent longitudinal ribs, have pointed apices, and are supported upon a stout curved peduncle; the seeds are numerous, angular, and of a light brown colour. The drug when placed in water immediately tinges it a bright yellow; to the taste it is bitter, like gentian.

Microscopic structure.—The seeds are thickly set with white feather-shaped hairs, all inclined towards their thick ends.

Chemical composition.—It contains much yellow colouring matter, probably Berberine; no complete examination has been made.

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* Five dirhems = 240 grains in 24 hours in decoction.

Commerce.—Trayamán is imported into Bombay from Persia, and is of some importance as a yellow dye for silk. It is worth about Re. ½ per lb.

Nigella sativa, *Sibthorp., Zorn. Ic.* 119. The seeds.

Vernacular.—Kalajira, Mugrela (*Hind.*), Kalonji (*Bomb.*), Karun-shiragam (*Tam.*), Shuniz, Siyah dánah (*Pers.*)

History, Uses, &c.—According to Birdwood, it is the Black Cummin of the Bible, the Melanthion of Hippocrates and Dioscorides, and the Gith of Pliny.* Ainslie mentions its use as a carminative, also as an external application mixed with sesamum oil in skin eruptions; as a seasoning for food, and as a protection for linen against insects. Forskahl, in his Medicina Kaharina, says that it is a native of Egypt, where it is called Hab-es Souda.† Roxburgh believes it to be a native of Hindostan. Anyhow, it must have been long known in India, as it has a Sanskrit name, Krishnajiraka. It is said to be cultivated in some parts of Guzerat; but I have been unable to substantiate this statement. Nigella seed is extensively used as a spice and as a medicine. The Hakeems describe it as heating, attenuant, suppurative, detergent and diuretic, and consider that it increases the menstrual flow and the secretion of milk; also that it stimulates uterine action. They give it, too, as a stimulant in a variety of disorders which are ascribed to cold humors, and credit it with anthelmintic properties. It is sprinkled over the surface of the bread made by Mahometan bakers along with Sesamum seed. M. Canolle has recently published the results of clinical investigations undertaken in the hospital at Karikol with black cummin seed. He has observed that after doses of 10 to 40 grams of the powdered seed the temperature of the body is raised, the pulse accelerated, and all the secretions stimulated, especially those of the kidneys and skin; in doses of 10 to 20 grams they possess a well marked emmenagogue action in dysmenorrhœa. (Journal de Médecine, 1883.)

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* Plin 20, 17; 19, 8; Cels 2, 34; Scrib. Comp. 131.

† الحبة السودا El-habbat-es-souda, i.q., الشونيز El-shooniz, or properly الشينيز El-sheeniz, for thus the Arabs called it according to Ibn-el-Aarabi, or, as some say, i.q., الحبة الخضرا El-habbat-el-khizra, because the Arabs often call black اخضر and green اسود. This seed is said in a tradition to be a remedy for every disease except death.

Description.—The seed is triangular, the umbilical end being smaller than the other, black, ⅛th of an inch long, testa rough; inside the testa is a white oily kernel. When rubbed, the seed diffuses a pleasant odour of lemons, with a slight *soupçon* of carrot.

Chemical composition.—The seeds of Nigella sativa have been analysed by H. G. Greenish (Phar. Jour. (3) X., 909, and 1013), with the following results:—One hundred parts of the seeds contain: Moisture 7·43, Ash 4·14, Fixed oil 37·00, Volatile oil 1·64, Albumen (sol. in water) 8·22, Mucilage 1·90, Organic acids ppt. by Cu. 0·38, ditto by Pb. 0·59, Sugar (Glucose) 2·75, Arabic acid (?) 3·21, Undetermined substance 1·79, Albumen (sol. in soda) 2·14, Metarabin 1·36, other substances dissolved by soda 5·38, Melanthin 1·41, Traces of oil, &c., removed by Alcohol 0·53, dissolved by Chlorine water and Sulphuric acid 3·85, removed by Chlorate of Potash and Nitric acid 7·52, Cellulose 8·32 — total 99·56. *Melanthin* bears a close analogy to Helleborin; like Saponin, it possesses considerable emulsifying powers. Greenish has also obtained Melanthin from all the aerial parts of N. sativa, but found it absent in the roots at all periods of their growth.

Commerce.—The Bombay market is supplied from Calcutta, Basara, and Cabul. Price 2 annas per lb.

Pæonia officinalis, *Linn., Bot. Mag., t.* 1784. The tubers.

Vernacular.—Úd-sálap (*Hind.*), Ude-sálam (*Bomb.*) *

History, Uses, &c.—This drug is the Female Peony of Dioscorides, and was esteemed by the ancients as a valuable remedy in uterine obstructions, colic, bilious obstructions, dropsy, epilepsy, convulsions and hysteria. Dioscorides describes two kinds of Peony, male, P. corallina, and female, P. officinalis,† these are the two kinds of Fawánia described by Arabic and Persian writers. The roots of the first are turnip-shaped and about as thick as the thumb; those of the second consist of oblong tubercles attached by a stout fibre to a rhizome. The plant and roots are figured by Guibourt, Vol. III., p. 763. Úd-sálap is used by the natives as a blood purifier for children. In the time of Galen a superstition prevailed that Peony root enclosed in a bag and hung round a child's neck both prevented epileptic attacks and cured them, and this belief is not extinct among the peasantry of Europe even now; they also believe that wearing the seeds will prevent the dangers of dentition. The plant has been proved not to be inert; it produces headache, noise in the ears, confused vision, colic and vomiting if taken in full doses (60 grs.)

Description.—The dried tubers are from 1 to 3 inches in length, and ½ inch to ¾ inch in diameter, tapering to a point at both ends; the external surface is brown and channelled longitudinally; the interior is starchy and white; the cortex on section is seen to be hard and gritty and of a yellowish colour; taste slightly acrid; the central starchy portion is almost tasteless. The odour of the freshly cut tuber is faintly acrid.

Chemical composition.—Wiggers obtained from the fresh root a distillate having the odour of bitter almonds, and acquiring a blood-red colour by ferric chloride; separated by means of ether the volatile oil had a pale yellow colour; the analysis of the fresh root by Morin proved the presence of starch, sugar, fat, malates, oxalates and phosphates, a little tannin, &c. (Confer. Stillé and Maisch, National Dispensatory, 2nd Ed., p. 1031.)

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* Corruption of عود الصليب (Aod-el-salib) or '*wood of the cross,*' an Arabic name for the root of P. corallina, because on section it shows two lines crossing one another, which are not seen in the Female Peony.

† Dios. iii. 148. Plin. 25, 4.

Commerce.—The tubers are imported from Turkey.

Coptis teeta, *Wallich, Griff. Ic. iv., t.* 660, *f.* 2. The rhizome.

Vernacular.—Mámírán, Mishmí títa (*Hind., Bomb.*)

History, Uses, &c.—Mámírán, is noticed by the early Arabian writers as a kind of Turmeric (Urúk). The plant is described by Mír Muhammad Hussain "as having leaves like ivy; it is said to grow near water in the hilly parts of India, China, and Khorasán. The Indian kind is described as yellow with a brown tinge; the Chinese as yellow; the Khorasán as greenish brown; the seed is said to be like sesamum. The best kind is the Chinese, which should be small, yellow, hard, and knotty; it is said to keep good for twenty years." Whether the three kinds here described are all varieties of Coptis, it is impossible to decide. Indian writers say that Mámírán used as a collyrium clears the sight, and as a snuff the brain, and that it relieves toothache. Internally it is given in jaundice, flatulence, and visceral obstructions. A further account of its history will be found in the Pharmacographia (p. 3), from which it would appear to have been known to the Greeks.[*] It was first described by Wallich in 1836 (Trans. of Medl. and Phys. Soc. of Calcutta, VIII., 85). It is worthy of notice that this drug, and extract of Barberry (Rusot), both containing a large quantity of Berberine in a soluble condition, are used as collyriums by the natives in certain catarrhal and rheumatic affections of the conjunctiva (confer. Prof. Simpson in Phar. Jour. 1854, Vol. 13,

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[*] The *μαμιρὰς* of Paulus Ægineta, who doubtless obtained his knowledge of it from the early Indian traders; the drug probably passed by the same commercial route as it does now, viz., from China to Western India and thence to Europe.

p. 413). Lately Coptis root has been chiefly used as a tonic by Europeans in India; it has the advantage of acting gently on the bowels.

Description.—Two distinct varieties of this drug are met with in the Bombay market. The kind most esteemed is a yellowish rhizome, as thick as a crow-quill or larger, having a few spinous projections where rootlets have been broken off; the whole rhizome is jointed, but at the upper end the joints become much more marked, and a stem clasping petiole often remains attached to each. The second kind is as thick as a goose-quill, and covered with thin wiry rootlets; it often branches at the crown into two or three heads, which terminate in tufts of leaf stalks, crowded together, and not separate as in the first kind; the rhizomes of both kinds are contorted, and have a short fracture, the centre is spongy, and the surrounding portion bright yellow and woody; taste purely bitter. The first kind corresponds with the description of Coptis root in the Bengal Dispensatory. The second kind with the description of that drug in the Pharmacographia.

Microscopic structure.—The bark of the second kind is much the thickest, and is softer and more corky than that of the first; in both kinds bundles of orange-coloured schlerenchymatous cells are present, and the medullary rays contain starch; the wood is arranged in distinct wedge-shaped bundles, round a central parenchymatous portion, having a structure similar to that of the inner cortex.

Chemical composition.—Coptis root contains 8½ °/₀ of Berberine so combined as to be easily soluble in water; the nature of this combination has not yet been determined. E. Z. Gross has separated from Coptis trifoliata, Salisb. *Coptine,* a colourless alkaloid. Coptine forms with potassio-mercuric iodide a crystalline precipitate which dissolves in sulphuric acid to a colourless liquid, becoming purple-red when heated.

Commerce.—Both kinds of the drug come from China, *viâ* Singapore, in bulk. The first sort is worth Rs. 3¼ per lb.; the second Rs. 2.

Thalictrum foliolosum, *D. C., Royle Ill., t.* 51. The root.

Vernacular.—Pílíjarí (*Hind.*), Gurbianí, Pashmaran. (*Punj.*)

History, Uses, &c.—The genus Thalictrum is found in the temperate and cold northern regions of Asia, it is very rare in the South, but one species, T. Dalzellii, is found on the mountains of the Western Peninsula. In Europe T. flavum, under the names of *Meadow Rue, Rue des prês, Fausse rhubarbe, Rhubarbe des pauvres, Unächte rhabarber, Wiescurante* and *Pigamo,* has long been used as a rustic medicine on account of its tonic and aperient properties. T. foliolosum, and perhaps another species from Arracan, have been used for a similar purpose in India from an early date. In the first edition of this work it was suggested that one of the commercial varieties of Mámírán might be the root of T. foliolosum, but having since received authentic specimens of the plant from the Saharunpore Gardens, I am now able to say that it bears no resemblance whatever to Thalictrum root. I have also been able to identify as a Thalictrum the drug which is occasionally to be seen in the shops under the name of *Piaranga,* and which is treated of at great length in the Makhzan-el-Adwiyá as a root which is brought from Arracan to Sylhet and Islamabad, and thence distributed to other parts of India. The people of Arracan appear to consider it as a panacea. The only reliable information we have as to the properties of *Pílíjarí* is contained in the Bengal Dispensatory, where the result of a trial of the root, supplied from the Saharunpore Gardens, is related :—"Five grains of the powder, or two grains of the watery extract given three times a day in some cases prevented, and in others moderated the accession of fever, and at the same time acted gently on the bowels. The only sensation experienced was warmth at the epigastrium and a general comfortable feeling."—(Beng. Dis., p. 161.) I administered the Piaranga of the shops in the form of a tincture to some extent when at the European General Hospital, Bombay, and found it a good bitter tonic, comparable with gentian.

Description.—Roots long, nearly straight, without rootlets, stout and woody, from ½ inch or more to ¼ inch in diameter.

Bark smooth, wrinkled longitudinally, yellowish brown; wood hard, very porous, and of a bright yellow colour, when wet it stains the fingers yellow. Magnified, the porous woody stem is seen to be traversed by medullary rays consisting of several rows of elongated cells; the bark shows a brown suber, and numerous rows of tangentially extended cells; opposite the terminations of the medullary rays, the cells take a rounded form and their arrangement becomes irregular; between the terminations of the medullary rays there is a large deposit of yellow colouring matter with thickening of the cell walls, forming yellow columns which extend to the suber and often end in patches of liber cells. The root contains no starch; at first sight it might be mistaken for liquorice root; it is extremely bitter.

Chemical composition.—Thalictrum root contains a large quantity of Berberine, so combined as to be readily soluble in water.

Commerce.—It occasionally appears in the shops in small quantities as Piaranga root.

Clematis triloba, *Heyne. in Roth. Nov. Sp.* 251.

Vernacular.—Morwel or Ránjai (*Bomb.*) It used as a remedy in leprosy, blood diseases, and fevers* (*Nighanta*). In the Concan the juice of the leaves mixed with that of the leaves of Holarrhena antidysenterica is dropped into the eye to cure Staphyloma; about two drops is used.

Description.—Climbing, all softly silky; leaves small, on longish petioles, simple or ternately divided, elliptic ovate or cordate, 3-nerved. Panicle many flowered; lower bracts leafy, flowers 1½ to 2 inches diam., white, appear in September; sepals 4 to 6, membranous, oblong, silky outside; filaments narrow, linear, glabrous. Mountains of Máwal district near Bombay.

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* The Clematis vitalba, Linn. *κληματίς ἑτέρα* of Dioscorides was used for similar purposes by the Greeks. The plants of this genus have acrid properties. Braconnot has observed that the active principle may be distilled with water and is soluble in fixed oils.

MAGNOLIACEÆ.

Illicium anisatum, *Loureiro, Bentl. and Trim., t.* 10. The fruit.

Vernacular.—Bádián-i-khataí (*Pers.*), Anasphal (*Hind.*), Anna shuppu (*Tam.*), Bádián (*Bomb.*)

History, Uses, &c.—It would appear that star-anise has long been in use in China and Japan, but was not known in India until a comparatively recent date. Persian works on Materia Medica, written about 100 years ago, speak of it is a new medicine. The authors of the Pharmacographia trace its introduction into Europe as far back as 1588; in those days it came by way of Russia, and was known as Cardamomum Siberiense.

The I. religiosum appears until quite recently (1880) to have never been noticed in commerce. Thunberg and Von Siebold have remarked upon its want of fragrance, and Flückiger and Hanbury state that the fruit is not collected. Recently about 20 bales of star-anise with hardly any odour were offered for sale in Bombay by a Calcutta merchant; it differed from the ordinary commercial article in having thirteen carpels instead of eight, the structure of the seed and carpel being similar, except that the ends of the carpels were more turned up, and the colour rather darker; moreover, most of them were abortive, which is not the case with I. anisatum; when broken a faint odour only could be preceived; it consequently proved unsaleable. There can, I think, be little doubt that this article must be the produce of I. Griffithii, an Indian species. In Native medicine star-anise is considered to be hot and dry in the second degree; and is described as carminative, expectorant, and diuretic; it is often given in infusion with tea, and is mixed with food as a spice. The oil is also imported in leaden or tin jars containing 12 catties; it is considered to have a sweeter taste than the oil of Pimpinella anisum, but in other respects can hardly be distinguished from it.

Description.—For a very complete description of the commercial article, see Pharmacographia, p. 21. I. Griffithii has narrower and more numerous carpels, one or two only in each fruit are fertile; a handful of fruit upon examination proved to be all provided with 13 carpels; they are of a dark reddish brown colour, much wrinkled on the under surface; the seeds correspond with those of I. anisatum; the taste is feebly aromatic at first, afterwards bitter and astringent.

Microscopic structure.—The fruit of I. Griffithii has the same structure as that of I. anisatum, but in the external loose dark brown layer of cells, hardly any globules of essential oil can be seen; on making sections for the microscope the knife is immediately stained black by tannin, which is not the case with I. anisatum; for a microscopic description of the latter article consult the Pharmacographia, p. 21.

Chemical composition.— Star-anise contains from 4 to 5% of volatile oil, which is hardly to be distinguished from oil of anise; it also contains much sugar, probably cane.

The fruit of I. Griffithii would appear to contain some bitter principle as well as tannin. According to Eykman (1880) star-anise contains an alkaloid which has not been further examined.

Commerce.—Star-anise is shipped to Bombay from China in large quantities, and two qualities are met with, selected in boxes worth Rs. 17 per Surat maund of 37½ lbs., and broken in bags, value Rs. 14 per maund. The oil which comes from China in 12 catty tin jars sells for Rs. 4½ per catty.

Michelia champaca, *Linn. var. Rheedii. Wight Ill. i., t. 5, f.* 6. The bark.

Vernacular.—Champa (*Hind.* and *Bomb.*), Shampangi (*Tam.*), Pivalá-cháphá (*Mar.*)

History, Uses, &c.—There appear to be several varieties of Michelia which have been produced by cultivation. M. Rheedii, which is referred by Hooker and Thomson to M. champaca, is cultivated in this part of India for the sake of its yellow, sweet-scented tulip-like flowers, which are made into a wreath (*veni*) and worn by women at the back of the head. The champa appears to have been cultivated in India from a very early date, but does not appear to have been considered of any importance as a medicine; the bark is mentioned in the secondary list of the Pharmacopœia of India as having febrifuge properties; but the natives of this part of India do not use it, nor is it to be met with in the shops. Dr. Kani Lall Dé states that it is an excellent substitute for Guaiacum. (Watts' Cat. Calc. Exhib.)

Description.—The fresh bark is covered externally by a light brown epidermis, which can be easily removed by friction; beneath this, it is of a reddish brown colour mottled with longitudinal green stripes, and pale yellow scars of irregular form; the inner surface is yellowish and fibrous, taste feebly bitter, with a faint aroma. The root bark is more strongly bitter.

Microscopic structure.—It is chiefly remarkable for numerous bundles of liber cells, and for aggregations of large stony cells of a bright yellow colour. The parenchyme contains much starch.

ANONACEÆ.

Anona squamosa, *Linn.*, *Rheede Hort. Mal. iii.*, 29; *Gärtn. Fruct. ii.*, *t.* 138. The seeds.

Vernacular.—Sítáphal (*Hind.* and *Bomb.*), Sítá-pullum (*Tam.*), Ata (*Beng.*)

History, Uses, &c.—The custard-apple has been long naturalized in India, and has received the Sanskrit name of Gandagatra; it is too well known to require description. The seeds, leaves, and immature fruit, contain an acrid principle, which is destructive to insect life; the seeds are much used by the natives for removing lice from the head; they require to be applied with caution; for, if any particles get into the eye, much pain and redness is produced. The author of the Makhzan notices the poisonous action of the seed upon lice, and says that when applied to the os uteri, they cause abortion. The fruit is called Sharífah and Káj in Persian. Babu T. N. Mukharji in his Amsterdam Catalogue states that the ripe fruit mixed with salt is used as a maturant, and that the root is considered a drastic purgative, and is administered by the natives in acute dysentery.

Description.—Seed dark brown, polished, with two lateral ridges; tapering towards the umbilical end, where there is a prominent ring, with a central pit, length about $\frac{5}{8}$th of an inch, breadth $\frac{2}{8}$th, albumen large, ruminated, embryo minute.

Microscopic structure.—The testa is composed of two sets of yellow rod-like cells, with a narrow central cavity, the outer set are arranged vertically, but the inner project into the albumen and divide it into numerous small bundles. The albumen consists of large polyhedral cells filled with starch.

Chemical composition.—The seeds yield an oil and resin; the latter appears to be the acrid principle.

MENISPERMACEÆ.

Jateorhiza calumba, *Miers. Bentl. and Trim., t.* 13. The root.

Vernacular.—Kalamb-kí-jer (*Hind.*), Kalamb kachri (*Bomb.*), Kalamba ver (*Tam.*)

History, Uses, &c.—Calumba grows in the forests of East Africa, along the Mozambique Coast, in the Zambesi country, and Madagascar, the Arabs call it Sák-el-hamám. It has been introduced into Bombay, where the vine dies in the dry weather, and shoots up again in the rains. The drug appears to have been first introduced into India by the Portuguese. In Africa it would seem to have been long used as a medicine in dysentery, and other affections of the bowels. Flückiger and Hanbury's researches have traced its introduction into Europe to the Portuguese, as far back as 1671. Shortly after this date, Francisco Redi noticed it as an alexipharmic. It would then appear to have been neglected until re-introduced by Percival in 1773; since then it has been in constant use in

Europe as a mild tonic. The older English physicians in India probably became acquainted with it through the Portuguese. The natives seem not to have taken much notice of it until quite recently, probably because they were well supplied with indigenous drugs having similar qualities.

Description.—The drug consists of nearly round or oval transverse slices of the root, varying much in size; these, when freshly imported, are of a light, bright greenish yellow colour, and have their edges covered by a wrinkled, corky epidermis; the surface of the slice shows a central portion, often much contracted in the middle, the vascular bundles standing out as rough projections, and a cortical portion from 2 to 3 eighths of an inch thick. Calumba is light and breaks easily with a short starchy fracture, the odour is mossy, and the taste very bitter.

Microscopic structure.—Commencing externally we find a range of tabular cells forming the suber; within this, a broken line of thick walled yellow cells; and next a cellular parenchyme loaded with starch and yellow colouring matter, making up the bulk of the bark, and intersected by radiating bands of liber tissue. The central portion of the root consists of a starchy parenchyme, intersected by radiating bands, formed of bundles of large vessels, which are more or less surrounded by a layer of wood cells. The starch granules are very large and ovoid.

Chemical composition.—The root contains Columbin, Berberine, and Columbic acid. Columbin may be obtained by treating the root with alcohol of 75%, the alcohol is recovered, and the residue, after evaporation, dissolved in water, and shaken with ether, which takes up fatty matters and the Columbin; the latter is purified by crystallization from boiling absolute ether; it forms right rhombic prisms, and is neutral and very bitter. Columbic acid was obtained by Baedecker by adding hydrochloric acid to the product obtained by the treatment of an alcoholic extract of Columba by lime water; it forms strongly acid white crystalline flakes. Both Columbin and Columbic acid are very sparingly soluble in cold water or cold alcohol, and ether. (Dict. de Chimie; Wurtz., Vol. 1, p. 959.)

Baedecker has pointed out a connection between these three bitter principles.

If we suppose a molecule of ammonia NH^3 to be added to Columbin $C^{42}H^{44}O^{14}$, the complex molecule thence resulting will contain the elements of Berberine $C^{20}H^{17}NO^4$, Columbic acid $C^{32}H^{24}O^7$, and water 3 H^2O (Pharmacographia, p. 25).

Commerce.—Calumba root is imported into Bombay from the Mozambique Coast to the extent of from 200 to 400 bales annually; this seldom finds its way to Europe, that market being now generally supplied direct from Zanzibar. The bales are of matting, and contain about one cwt. each; value Rs. 3½ per Surat maund of 37½ lbs.

Anamirta cocculus, *W. & A., Bentl. and Trim., t.* 14. The fruit.

Vernacular.—Kákmári (*Hind.*), Kákphal, Karwi (*Bomb.*), Kákkáy-kolli-virai (*Tam.*)

History, Uses, &c.—This plant, which is a large climbing shrub with rough corky bark, abounds on the western coast of India; its properties have been known to the Hindus from an early date, and the fruit appears to have been long in use as a remedy in certain skin affections, possibly of parasitic origin. The Arabs were probably also acquainted with it, but there is no satisfactory evidence upon this point to be gathered from their writers upon Materia Medica. According to Flückiger and Hanbury, Ruellius was the first European writer who mentioned it (De Natura Stirpium, Paris, 1536), under the name of Cocci orientis. Gerarde calls it Cocculus Indicus; it also bore the name of Coccole di Levante (Levant berries), from its being introduced into Europe through the Levant ports. In the Concan the juice of the leaves with that of the root of Gloriosa superba is used to kill Guinea-worms.

Description.—A somewhat reniform purple fruit, the size of a small grape, growing in a long bunch, each branch of which supports from 1 to 3 of the drupes. The dry fruit is about the size of a large pea, dark brown, and wrinkled; below the concavity on one side there is a circular scar, to which a portion of the peduncle sometimes remains attached; above it is a small pointed projection, the remains of the style; within the dried pulp is a thin shell, which at the concave part of the fruit dips in deeply to form a placenta, which projects in the shape of two lobes into its cavity, upon these the kernel is moulded, and has consequently a cup-shaped form, the cavity of the cup being marked by a longitudinal ridge, corresponding to the fissure between the two lobes of the placenta. The kernel consists of two layers of albumen, which, when separated, disclose a superior radicle, from which two thin cotyledons diverge, narrow at first, but afterwards widening. Cocculus Indicus is very bitter, and if kept long has a rancid oily smell.

Microscopic structure.—The albumen is composed of polyhedral cells containing crystals of fatty matter.

Chemical composition.—The pericarp is said to be emetic, and to contain two crystallisable tasteless substances, Menispermine and Paramenispermine, but this is doubtful, and requires confirmation. Picrotoxin, $C^{12} H^{14} O^{5}$, a crystalline substance, was discovered in the seed by Boullay in 1812; it is the poisonous principle, and is soluble in water and alkalis. Flückiger and Hanbury give the following summary of its properties:—"Picrotoxin does not neutralize acids, it dissolves in water and in alkalis; the solution in the latter reduces cupric oxide like the sugars, but to a much smaller extent than glucose. The alkaline solution is not precipitated by chloride of ammonium. The aqueous solution is not altered by any metallic salt, or by tannin, iodic acid, iodohydrargyrate or bichromate of potassium; in fact, by none of the re-agents which affect the alkaloids. It may thus be easily distinguished from the bitter poisonous alkaloids, although in its behaviour with concentrated sulphuric acid and bichromate of potassium, it somewhat resembles strychnine, as shown in 1867 by Kohler. Picrotoxin melts at 200° C.; its composition $C^{9} H^{10} O^{4}$, as ascertained in 1877 by Paterno and Ogliadono, is the same as that of everninic, hydrocoffeïc, umbellic and veratric acids." (Pharmacogr., p. 32.)

By fractional distillation from benzol, Barth and Kretschy (1880) separated Picrotoxin into three bodies. One, for which the name Picrotoxin was retained, melts at 201° C., and has the composition $C^{15} H^{16} O^{6} + H^{2} O$. The second, *Picrotin*, $C^{25} H^{30} O^{12}$, has similar properties, but melts at 250° C., is less freely soluble in benzol, and is not poisonous. The third compound, *Anamirtin*, $C^{19} H^{24} O^{10}$, remains in the mother liquor on re-crystallizing Picrotoxin from water; it is but slightly bitter, is not poisonous, and its alkaline solutions do not reduce metallic salts.

Commerce.—Cocculus Indicus is brought to Bombay from the Malabar Coast in large quantities for exportation to Europe; it is hardly ever used in Bombay, and is seldom to be seen in the druggists' shops. Value, Rs. 3 per Surat maund of 37½ lbs.

Cissampelos Pareira, *Linn.*, *Bentl. and Trim.*, *t.* 15. The root.

Vernacular.—Dakhnirbishí Akanádí (*Hind.*), Pahármúl (*Bomb.*), Pata (*Tel.*), Katorí (*Sind*), Nemuka (*Beng.*)

History, Uses, &c.—The plant appears to have been long in use as a bitter tonic and diuretic in Southern India, and is mentioned by Ainslie; it is in use as far north as the Goa territory at the present time, but in Bombay it is little known as a medicine, although very common in hedges and waste ground during the rainy season. Chakradatta recommends it in fever with diarrhœa and in internal inflammations. In Europe it has never been an article of commerce, though for a long time it was supposed to produce the Pareira root of the shops (confer. Pharmacographia, p. 25). The Sanscrit names are Ambáshta, Páthá and Venívela (braided creeper). In the Punjab and Sind the leaves and roots are employed in the cure of ulcers. (Murray).

Description.—The root is about half an inch in diameter, bark light brown, marked with longitudinal furrows, and transverse constrictions, sometimes very crooked and knotty, from growing in stony ground, seldom branched, fracture fibrous, bark corky, and thick for the size of the root, wood yellowish, in from 10 to 15 wedge-shaped bundles, containing many large vessels, and separated by narrow medullary rays; odour none; taste very bitter.

Microscopic structure.—It cannot be distinguished from several other Menispermaceous roots common in India.

Chemical composition.—The pelosina of Wiggers, which Flückiger has found to be identical with berberia, exists in this root to the extent of about ½ per cent. (Flückiger.) Pelosina is amorphous, nearly insoluble in water, somewhat soluble in ether and carbon bisulphide, freely soluble in chloroform and acetone, also in alcohol and benzol; its nitrate is sparingly soluble, and its acetate is precipitated by sodium phosphate, by the group reagents for alkaloids, and by iodide, ferrocyanide, ferridcyanide, and chromate of potassium; the precipitate with phosphomolybdic acid dissolves in ammonia with a blue colour.

Tinospora cordifolia, *Miers.*, *Bentl. and Trim.*, *t.* 12. The stem.

Vernacular.—Gurach, Giloe, Gulancha (*Hind.* and *Beng.*), Gulwail, Guloe, Gharol (*Bomb.*), Shindil-kodi (*Tam.*), Amrit-yel (*Goa*).

History, Uses, &c.—A well-known medicinal plant, long in use in Hindu medicine, and considered to be cold and dry, or, according to Arabic and Persian writers, hot and dry in the first degree. In native practise it is much valued as an antiperiodic in fevers, and as a tonic and alterative; it is also credited with aphrodisiac properties.* The fresh plant is said to be more efficient than the dry, it is taken with milk in rheumatism, acidity of the urine and dyspepsia. The juice with Pakhanbed and honey is given in Gonorrhœa, and is an ingredient in Paushtiks given in *Phthisis.* The stem, if placed upon a bush in the open air, will retain its vitality through the hot season, and when the rains commence, put forth leaves and long whipcord like roots, which soon reach the ground. Guloe is very common on the Western Coast, and may always be obtained in the green state; the dry stem is to be seen in every drug shop; from it is prepared a kind of starch known in Hindustani as Giloe ka sat, and in some parts of India as Palo. It is prepared by powdering the stem and washing out the starch with water; the latter retains a little of the bitterness of the drug. Giloe appears first to have attracted the notice of Europeans in India at the early part of the present century, and to have been favourably spoken of by those who have tried it as a tonic, antiperiodic and diuretic, but it has never come into general use in European practice. It is now official in the Pharmacopœia of India, and has lately (1884) been re-introduced to the notice of the profession in Europe as a specific tonic, antiperiodic and diuretic. (Conf. Zeitschrift des oesterr. Apoth. Ver. 1884, 312).

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* For original Sanskrit prescriptions, see Dutt's Hindu Materia Medica, p. 105; most of them contain several other equally active remedies.

Description.—The fresh stem has a green succulent bark, covered by a thin brown epidermis, which peels off in flakes; it is studded with warty prominences, and here and there gives off roots and branches bearing smooth heart-shaped leaves, or bunches of red berries; when dry it shrinks very much, and the bark separates from the wood, and becomes of a dull brown colour; the latter consists of a number of wedge-shaped bundles; the taste is very bitter; the odour not in any way peculiar.

Miscroscopic structure.—The suber consists of tabular cells, and thick walled yellow cells, in alternate layers; the woody portion is not to be distinguished from that of several other Menispermaceous plants common in India.

Chemical composition.—The extract called Palo and Sat-i-giloe is simply starch, which, through not having been washed, retains some bitterness. The stem has been examined by Flückiger (1884) by boiling it with alcohol and a little hydrate of calcium, the alcohol was then evaporated and the residue extracted by means of chloroform. The latter liquid was found to contain an alkaloid in very small quantity ; on evaporating it and dissolving the residue by means of acidulated water, a solution was obtained, which proved to contain merely a trace of Berberine. The alcoholic extract after it had been exhausted by chloroform as above stated, was dissolved in boiling water and precipitated by tannic acid, avoiding an excess of the acid. The deposit thus obtained was mixed with carbonate of lead, dried and exhausted with alcohol, which on evaporation yielded the bitter principle. By boiling this bitter principle with dilute sulphuric acid, sugar was produced and it lost its bitterness. Neither the original bitter principle or the product derived from it could be crystallized.

Commerce.—The stems are collected and dried by the country people in the Concans, who bring them for sale to Bombay. Value, Rs. 2½ per Surat maund of 37½ lbs.

Cocculus villosus, *D. C. Plu. Am., t.* 384, *f.* 3, 7. The root and leaves.

Vernacular.—Jamti-ki-bel (*Hind.*), Wassanwel, Párwel (*Bomb.*), Káttuk-kodi (*Tam.*)

History, Uses, &c.—A very widely-distributed plant of climbing habit, very common in the neighbourhood of Bombay ; it has no doubt been long in use as a domestic remedy in all parts of the country, but few of the native works on Materia Medica notice it. It is a disputed point whether this plant or the Pedalium murex is the true Furíd Bútí upon which Sheik Furíd is reputed to have sustained life for some time. The juice of its leaves mixed with water has the property of coagulating into a green jelly-like substance, which is applied externally by the country people under various circumstances on account of its cooling nature, and is also taken internally sweetened with sugar as a cure for Gonorrhœa. The root is said to be alterative and to be a good substitute for Sarsaparilla. Roxburgh says that a decoction of it in goat's milk flavoured with long pepper is administered in rheumatic and old venereal pains, and is considered heating, laxative and sudorific. (Fl. Ind. III., 815.) In the Concan the roots rubbed with Bonduc nuts in water are administered as a cure for belly-ache in children, and in bilious dyspepsia they are given in 6 massa doses with ginger and sugar; they are also an ingredient with a number of bitters and aromatics in a compound pill which is prescribed in fever. The Concan Vaids give this plant the Sanskrit name of *Vanatiktika.*

Description.—Leaves 2 to 3 by 1½ to 2 inches, sometimes sublanceolate, retuse or obtuse, and mucronate; sometimes three-lobed, base subcordate or truncate, young when villous on both surfaces; petiole ½ inch long. Root very crooked and twisted upon itself, keeled, seldom branched, but giving off a few thin fibrous rootlets; external surface light brown, nearly smooth, transverse sections white, marked with radiating yellowish lines; odour peculiar, like raw potato; taste disagreeable, and bitter.

Microscopic structure.—The outer bark consists of empty tabular cells; within this are several rows of larger cells containing starch, and then a thick cambium layer; the central portion of the root consists principally of large cells filled with starch; this is intersected by 9 to 10 radiating, almost linear bands of wood cells, amongst which are a few large vessels; the wood cells are dotted and have very thick walls.

Commerce.—Not an article of commerce.

Cocculus leœba, *D. C. Plu. Am., t.* 384, *f.* 4.

Vernacular.—Ullar-billar (*Sind*).

Description.—A common scandent shrub in the Punjab, Sind, Afghanistan, Arabia and Persia. It has bitter and tonic properties, similar to those of Tinospora cordifolia, and is prescribed as a febrifuge.

Coscinium fenestratum, *Colebr. Miers. in Hook. Bot. Mag., t.* 6458 ; *Contrib. iii.* 22, *t.* 88. The stem.

Vernacular.—Jhár-kí-haldí (*Hind.* and *Bomb.*), Mara-manjal (*Tam.*)

History, Uses, &c.—The stem is said to have been long in use in Ceylon and Southern India as a bitter medicine, and as a yellow dye. I have not met with any account of it in native works; but there is reason to believe that it has sometimes been confounded with Darhalad, the stem of the Barberry. Ainslie was probably the first European physician who noticed it. He says:—"Mera Munjil is the Tamil name of a round yellow-coloured bitterish root, common in the bazaar, about one inch in circumference, employed in preparing certain cooling liniments for the head, and is also used as a yellow dye; it is brought from the mountains, but I have endeavoured in vain to ascertain the plant." Subsequently it attracted attention in Ceylon by being mistaken for Calumba, and some of it found its way to Europe, where it became known as False Calumba and Tree Turmeric; it is favourably noticed in the Pharmacopœia of India, and is used at the present time in the hospitals of the Madras Presidency as a bitter tonic.

Description.—Cylindrical woody stems, diameter 1 to 4 inches, covered with a pale corky bark, wood of a bright greenish yellow colour, and open porous structure, having no concentric rings, but conspicuous medullary rays; taste purely bitter. The wood is much less hard than that of the Barberry, and of a lighter colour.

Chemical composition.—Calumba wood was analysed by Perrins in 1853, and found to contain Berberine (Phar. Jour., Vol. XII., pp. 180—500).

Commerce.—It is not an article of commerce in Bombay.

BERBERIDEÆ.

Berberis aristata, *D. C. Bentl. and Trim., t.* 16.

B. lycium, *Royle, Ill.* 64.

B. asiatica, *Roxb. Deless. Ic. Sel. ii., t.* 1.

The stem, root-bark, extract and fruit.

Vernacular.—The stem, Dáruharidra (*Sans.*), Dárhalad (*Hind.* and *Bomb.*) The extract, Rusot, Raswanti (*Hind.* and *Bomb.*) The fruit, Zarishk (*Pers.*, *Hind.* and *Bomb.*)

History, Uses, &c.—Various species of Barberry occur on the Himalaya and Nilghiri mountains in India, at elevations between 6,000 and 10,000 feet. The wood, extract, and probably the fruit, have been used by the natives from a very early date. The Greeks were acquainted with the extract under the name of Indian Lycium as long ago as the first century; it would appear, though, that there were other kinds of Lycium in use at that time (confer. Pharmacographia, p. 34).[*] The early Arabian writers were also acquainted with it by the name of Huziz-i-Hindi,[†] and mention its Indian name, which some of them derive from Ras, juice, and Uth (*uthna*, to boil). Hakím Abd-il-Hamíd describes its manufacture from the powdered wood by exhaustion with water, filtration, and admixture with an equal bulk of cow's milk, the mixture being finally evaporated to the consistence of an extract, and enveloped in leaves; this method of preparation is the same as that described in Sanskrit works. Royle, in 1833, brought Rusot more prominently to the notice of Europeans; since then it has been pretty extensively employed as a tonic and febrifuge. The root-bark of Barberry is now official in the Pharmacopœia of India, it is noticed in the Tuhfat-el-muminín under the name of Árghis, and is said to possess all the properties of Mámírán. In the bazaars the stem, extract and fruit are always obtainable;

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[*] Dios. i. 117; Plin 24, 14; Cels. 5, 26; 6, 7; 8, 6; Scrib. Larg. Comp. 19. in the early stage of ophthalmia.

[†] They describe two kinds, *Maki* or the *λύκιον* of the Greeks, and *Hindi* or Indian; the former was derived from Rhamnus infectorius, the berries of which are used in dyeing leather yellow.

the two first are considered cold and dry, and are prescribed as tonics and antiperiodics, especially when bilious symptoms and diarrhœa are present ; they are also used in menorrhagia. Rusot mixed with opium, alum, rock salt, chebulic myrobalans, and various other drugs, is much used as an external application in inflammatory swellings, and is rubbed in round the orbit in painful affections of the conjunctiva ; it is also used mixed with honey as an application to aphthæ and abrasions of the skin, and mixed with milk it is dropped into the eye in conjunctivitis. The fruit is cooling and acid.

Description and Microscopic structure.—Dárhalad occurs in pieces, 1 to 2 inches in diameter, covered by a soft, corky, light brown bark ; beneath this is a hard layer of stony cells, forming a complete coating to the stem ; this layer is marked by longitudinal furrows corresponding to the medullary rays, which are very prominent and close-grained, and contain many stony cells ; between the rays are wedge-shaped portions of wood supplied with very large fenestrated vessels, and external to each wedge-shaped portion is situated a peculiar band of a pale yellow colour, which lies in contact with the stony envelope ; there is a small close-grained central column, consisting of cells containing starch ; all parts of the wood are impregnated with yellow colouring matter freely soluble in water.

Rusot is a dark brown extract of the consistence of opium, having a bitter and astringent taste ; readily soluble in water, partly so in rectified spirit, forming a rich yellowish brown solution, which becomes bright yellow when diluted. Zirishk is a moist sticky mass of small black fruit, rather larger than English Barberries ; most of them are abortive, but a few contain one or two oblong seeds about 3-20ths of an inch in length, with a thin roughish brown testa, beneath which is a membranaceous covering ; the perisperm is yellow, embryo nearly as long as the perisperm, yellow, erect, cotyledons oblong, radicle subcylindric, inferior.

The root bark is brittle, externally light brown and corky, beneath the suberous layer it is of a dark brown, with a greenish yellow tinge, fibrous, and very bitter.

Chemical composition.—The bitter principle of Barberry root and wood is Berberine, which it contains in great abundance. The fruit contains tartaric and malic acids. Berberine or Berberia was first discovered by Chevallier and Pelletan (1826) in the bark of Xanthoxylum clavæ Herculis, *Linn.*, and named *Xanthopicrit*; its identity with berberine was proved by Perrins (1862). A. Buchner, who obtained it (1835) crystallized from barberry root believed it to possess acid properties and named it berberin. It had been previously separated in an impure condition by Brandes (1825) and by Buchner (1830). G. Kemp (1841) noticed that it forms crystallizable compounds with various mineral and organic acids, but its alkaloidal nature was first proved by Fleitmann (1846). Since then it has been discovered in numerous plants of the orders Berberidaceæ, Ranunculaceæ, Menispermaceæ, &c., &c. (Stillé and Maisch, Nat. Disp. 1884, p. 314.)

Commerce.—Dárhalad comes to Bombay from Northern India and from the Madras Presidency. Rusot and Zirishk from Northern India. Value, Dárhalad, Rs. 3½; Rusot, Rs. 8-9 per maund of 37½ lbs.; Zirishk, Re. ¼ per lb.

NYMPHÆACEÆ.

Nelumbium speciosum. *Wight Ill. i., t. 9; Bot. Mag., t.* 903. The flowers.

Vernacular.—Kamal, Kanval (*Hind.* and *Bomb.*), Ambal (*Tam.*)

History, Uses, &c.—This is a classical plant amongst the Hindus. Mr. O. C. Dutt, in his Hindu Materia Medica, speaks thus of it:—"These beautiful plants have attracted the attention of the ancient Hindus from a very remote period, and have obtained a place in their religious ceremonies and mythological fables; hence they are described in great detail by Sanskrit writers. The flowers of N. speciosum, called *Padma* or *Kamala*, are sacred to Lakshmi, the goddess of wealth and prosperity. The white variety of this plant is called *Pundarika,* the red *Kokanada,* and the blue *Indivara.* The entire plant, including root, stem, and flowers, is called *Padmini.* The torus or receptacle for the seed is called *Karmikara,* and the honey formed in the flowers *Makaranda.* The filaments round the base of the receptacle pass by the name of *Kinjalka,* and the leaf stalk by that of *Mrinala.*" N. speciosum is the κύαμος άιγύπτίος of Theophrastus and the sacred lotos of the Egyptians. The Arabians and Persians, under the name of *Nilufer,* which, they say, is a corruption of an Indian name, and derived from Nil, water, and Phala, fruit, describe the several varieties of Nelumbium and Nymphæa, and do not appear to consider the flowers of the former plant in any way superior to the latter. They direct the white and blue kinds to be preferred. Both Hindus and Mahomedans consider the flowers to be especially cooling and astringent, and consequently prescribe them in a variety of disorders which are supposed to proceed from heated humours, such as sanguineous fluxes from the bowels, &c., but they combine so many other substances with them that it is impossible to form any opinion as to their efficacy. As an external cooling application Lotus flowers are made into a paste with sandalwood or emblic myrobalans.

The seeds of N. speciosum (Kamal kakrí),* and of Euryale ferox (Makhána) are used as articles of diet. In times of scarcity the roots of N. speciosum are also made use of, but they are bitter and unpalatable.

Description.—The calyx consists of four to five deciduous sepals; the corolla of numerous deciduous petals, arranged in several rows; the stamens are numerous, in several rows, attached with the petals to the base of the receptacle; the stigma is sessile; the dry flowers have a brown colour; the seeds are black and like small acorns.

Commerce.—The seeds are imported from Persia in large quantities as an article of diet. The fresh flowers are brought to market in August for use in the temples. The dried flowers sold in shops as Kamal are generally those of Nymphæa.

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* Bákla-i-kubti or Bákla-i-nabti of Persian writers (Coptic bean).

PAPAVERACEÆ.

Papaver somniferum, *Linn., Bentl. and Trim., t.* 18. The juice, capsules, and seeds.

Vernacular.—Opium, Afiyún, Afím (*Hind.*), Aphím, Appo (*Bomb.*), Abini (*Tam.*) *Poppy seed,* Kashkásh (*Hind.*), Khaskhas (*Bomb.*), Gashagasha (*Tam.*) *The capsules,* Post (*Hind.* and *Bomb.*), Postaka-tol (*Tam.*)

History, Uses, &c.—Opium is not mentioned by the older Hindu writers; in works of later date it is named in Sanskrit Ahiphena. If we trace the history of the drug, we find that it was known to the Greeks in the beginning of the third century, B. C., and was probably first collected and prepared in Asia Minor. The Arabians next became acquainted with it, and converted the Greek name Opion into Afiyún; some of their writers mention this derivation, and say that the Greek word means soporific.* It is generally supposed that the Persians and Indians became acquainted with opium through the Arabians; but some Persian writers suppose that the Tiryák which Rustum obtained from Kaikáous to give to Sohráb was opium. For a further account of the history of the drug, the Pharmacographia and other standard works on Materia Medica may be consulted. The opium used in Western India is known as Malwa; it is collected in the province of that name, and, besides supplying the local markets, is largely exported to China. The following account of the cultivation of the Poppy in Malwa is given by Dr. Impey, who resided there for three years:—"For the successful cultivation of opium, a mild climate, plentiful irrigation, a rich soil, and diligent husbandry, are indispensable. In reference to the first of these, Malwa is placed most favourably. The country is, in general, from 1,300 to 2,000 feet above the level of the sea; the mean temperature is moderate, and range of the thermometer small. Opium is always cultivated in ground near a tank or running stream, so as to be insured at all times of an abundant supply of water. The rich black loam supposed to be produced by the decomposition of trap, and known by the name of cotton soil, is preferred for opium; though fertile and rich enough to produce thirty successive crops of wheat without fallowing, it is not sufficiently rich for the growth of the poppy until well-manured; there is, in fact, no crop known to the agriculturist, unless sugar-cane, that requires so much care and labour as the poppy. The ground is first four times ploughed on four successive days, then carefully harrowed, when manure, at the rate of from eight to ten cartloads an acre, is applied to it; this is scarcely half what is allowed to a turnip crop in Britain. The crop is after this watered once every eight or ten days, the total number of waterings never exceeding nine in all. One beegah takes two days to soak thoroughly in the cold weather, and four as the hot season approaches. Water applied after the petals drop from the flower causes the whole to wither and decay. When the plants are six inches high, they are weeded and thinned, leaving about a foot and a half betwixt each plant; in three months they reach maturity, and are then about four feet in height if well cultivated. The full-grown seed-pod measures three and a half inches vertically, and two and a half in horizontal diameter. Early in February and March the bleeding process commences. Three small lancet-shaped pieces of iron are bound together with cotton, about one-twelfth of an inch alone protruding, so that no discretion as to the depth of the wound to be inflicted shall be left to the operator; and this is drawn sharply up from the top of the stalk at the base to the summit of the pod. The sets of people are so arranged that each plant is bled all over once every three or four days, the bleedings being three or four times repeated on each plant. This operation always begins to be performed about three or four o'clock in the afternoon, the hottest part of the day. The juice appears almost immediately on the wound being inflicted, in the shape of a thick gummy milk, which is soon thickly covered with a brown pellicle. The exudation is greatest over-night, when the incisions are washed and kept open by the dew. The opium thus derived is scraped off next morning with a blunt iron tool resembling a cleaver in miniature. Here the work of adulteration begins—the scraper being passed heavily over the seed pod, so as to carry with it a considerable portion of the beard, or pubescence, which contaminates the drug and increases its apparent quantity. The work of scraping begins at dawn, and must be continued till ten o'clock; during this time a workman will collect 7 or 8 ounces of what is called 'chick.'* The drug is next thrown into an earthen vessel, and covered over or drowned in linseed oil, at the rate of two parts of oil to one of chick, so as to prevent evaporation. This is the second process of adulteration, the ryot desiring to sell the drug as much drenched with oil as possible, the retailers at the same time refusing to purchase that which is thinner than half-dried glue. One acre of well-cultivated ground will yield from 70 to 100 pounds of chick. The price of chick varies from 3 to 6 rupees a pound, so that an acre will yield from 200 to 600 rupees' worth of opium at one crop. Three pounds of chick will produce about two pounds of opium, from the third to the fifth of the weight being lost in evaporation. It now passes into the hands of the Bunneah, who prepares it and brings it to market. From 25 to 50 pounds having been collected is tied up in parcels in double bags of sheeting cloth, which are suspended from the ceiling so as to avoid air and light, while the spare linseed oil is allowed to drop through. This operation is completed in a week or ten days, but the bags are allowed to remain for a month or six weeks, during which period the last of the oil which can be separated comes away, the rest probably absorbs oxygen and becomes thicker as in paint. This process occupies from April to June or July, when the rain begins. The bags are next taken down, and their contents carefully emptied into large vats from 10 to 15 feet in diameter and six or eight inches deep. Here it is mixed together and worked up with the hands 5 to

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* ὄπιον. Latin, Opium or Opion. Plin. 20, 18; id. 25, 10. Poppy juice. The Arabian lexicographers regard the word as Arabic, the author of the Kámús derives it from the root فين, others from افن.

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* चिक *chik*, a common term in this part of India for the sticky juice of any plant.

6 hours, until it has acquired an uniform colour and consistence throughout, and become tough and capable of being formed into masses. This process is peculiar to Malwa. It is now made up into balls of from 8 to 10 ounces each, these being thrown, as formed, into a basket full of the chaff of the seed pods. It is next spread on ground previously covered with leaves and stalks of the poppy; here it remains for a week or so, when it is turned over and left to consolidate, until hard enough to bear packing; it is ready for weighing in October or November, and is then sent to market. It is next packed in chests of 150 cakes, the total cost of the manufacture at the place of production being about Rupees 14 per chest." The greater part of the opium produced in Malwa is consumed by opium-eaters. Poppy seed is an article of diet, being an ingredient in curries and in sweetmeats; from it is obtained a drying oil of a pale golden colour which bleaches well; it is inodorous, of agreeable flavour, and soluble in 25 parts of cold and 6 of boiling alcohol, sp. gr. 0·925 at 15° C.; it solidifies at 18 C.; does not easily become rancid; with the sulphuric acid test it turns of a dull yellow; the oil is present in the seeds to the extent of about 50°/o, but by the native process much less than this is obtained. The capsules and seeds are prescribed in diarrhœa; the former retain a small quantity of opium, and from them an intoxicating drink is sometimes prepared; they are met with in commerce in a broken state, and marked by the triple incision made to extract the opium. The seeds are of two kinds, grey and white, and appear to differ only in colour, from them is made the Sharáb-i-kashkásh of the Mahometan physicians.*

The following statistics of opium-eating at Balasore, in Orissa, have been collected by Vincent Richards. He says:—"I estimate that about one in every twelve or fourteen of the adult population use the drug; but I believe the habit is somewhat increasing; this increase in the consumption of the drug dates from the famine year 1866, and is not the result of a growing abuse of it by individual consumers, but of a more extended use of opium amongst the general population. There can be no doubt that opium-eating was greatly resorted to in the famine year, because it mitigated the sufferings arising from hunger and sickness, and enabled the poor people to exist on less food. The number of opium-eaters examined by me was 613, of whom 444 were men and 169 women; of the 444 men, 29 were between 15 and 25 years of age, 87 between 25 and 35 years, 165 between 35 and 45 years, and 163 above 45 years. Thus, by far the greater number were over 35 years of age. Of those above 45 years, 56 were between 45 and 50 years, 74 between 50 and 60 years, and 33 above 60 years. Of the 169 women, 10 were between 15 and 25 years of age, 33 were from 25 to 35 years, 47 from 35 to 45 years, and 79 were above 45 years of age. Here, also, the proportion of those above 35 years is greater. Many were over 50 years of age, and not a few 60. It must be understood that the ages are not given as exact; they are, however, approximately correct, and arrived at after careful inspection and inquiry. These remarks apply equally to the following, though the periods are not likely to be very inaccurate, as they embrace such a number of years. Not a few mention the famine year (1866) as the time at which they first contracted the habit. Of the men, 274 are said to have taken the drug for from 3 to 10 years, 100 for from 10 to 20 years, 48 from 20 to 30 years, and 22 for more than 30 years. Of the women 104 for from 3 to 10 years, 43 for from 10 to 20 years, 14 from 20 to 30 years, and 8 for more than 30 years. The average ages at which the habit was commenced were amongst the men from 20 to 26 years, and amongst the women from 24 to 30 years. The majority of eaters take their opium twice daily, morning and evening, but not a few in the evening only. Much depends upon the dose, and whether the person has been long addicted to the habit. The well-to-do people mix the drug with water and strain before drinking, but poor people swallow it just as it is sold by the opium vendor. The quantity taken varies from 2 grains to 45 or more daily; but as I shall show large doses are quite the exception, especially amongst the poorer classes. Of the 444 men, 266 took from 2 to 4 grains daily, 151 from 4 to 12 grains, 18 from 12 to 16 grains, and only 9 more than 16 grains—average 7 grains. Of the 169 women 132 took from 2 to 4 grains, 33 from 4 to 12 grains, and 4 only from 12 to 16 grains; not one took more than 16 grains—average 5 grains. The dose when large has always been gradually increased from the beginning; but it is not at all unusual to find, when the dose is small, that there has been no increase at all. There is not, therefore, that craving for increasing doses, which is generally supposed to exist, nor do the 5 or 7 grains as sold by the vendors represent the actual amount of pure drug, as it is not unfrequently adulterated with catechu and other substances. I think it must be conceded that the foregoing data prove conclusively that excessive use of opium amongst the agricultural classes, and they are the chief consumers in Orissa, is very rare indeed, and that its moderate use may be, and is indulged in for years without producing any decided or appreciable ill effects, except perhaps one to which I shall allude hereafter, though it is a question whether the fact is not rather a blessing from a humanitarian point of view, when we consider how prone destructive agents, such as war, famine, and pestilence are to begin their work of destruction immediately the increase of population proceeds too rapidly." As to the causes which first lead to the use of the drug, they may be summed up as follows:—"Sickness, example, and a belief in its aphrodisiacal powers. The majority are induced to begin the habit through disease, such as fever, elephantiasis, dysentery, colic, rheumatism, and diarrhœa. Some few asserted that they took the drug to enable them the better to undergo fatigue, and to make long journeys. There is one almost inevitable result of a prolonged indulgence in opium-eating, especially if immoderate, namely, a weakening of the procreative powers; in no fewer than 99 cases out of 125 into which I particularly enquired with a view to ascertaining the fact, was this the case; moreover, of the 125 married men, averaging 36 years of age, the average number of children to each was 1·11 after eleven years of married life. The average dose taken by these men was 14 grs. per diem, and the length of time they had been addicted to the habit 12 years. Opium-eating, at any rate in Balasore, does not conduce to either crime or insanity, since the inhabitants are a particularly law-abiding race, and the insanes are only 0·0069 per cent. of the population."—(*Indian Medical Gazette*, Vol. XII., No. 9, August 1st, 1877.) My experience of opium-eating in Western India, though not supported by statistics, leads me to form the same opinion as Vincent Richards with regard to the moderate use of the drug. I believe that excessive indulgence in it is confined to a comparatively small number of people amongst the well-to-do and wealthy classes of the community. More recently (1881), Dr. Moore has published his experience of opium-eating in Rajputana, which supports strongly Richards' opinion. The medicinal uses of opium are practically the same in India as in Europe. The Hindus class it among the *Calida*, but many of the Mahometan hakeems, following Galen, place it among the *Frigida*. The alkaloid Narcotine has been largely employed in India as an antiperiodic; it appears to succeed best when given in doses of from 3 to 6 grains. (Conf. Pharm. of Ind., p. 439.)

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* Take half a maund of poppy seeds, soak them for 24 hours in four maunds of water, then bruise the seeds, replace them in the same water and boil down to one half, rub on a strainer, and add one maund of sugar to the fluid obtained. Compare with Scrib. Comp. 73.

Description.—Malwa opium occurs in round or slightly flattened balls, weighing about 10 ounces each, and covered externally with some of the chaff from the capsules; its consistence is about the same as that of average Smyrna opium; appearance of section homogeneous; colour dark brown; odour like that of Smyrna opium. The full-grown capsule measures 3 inches to 3½ inches vertically, and is from 2 to 2½ inches in diameter; as found in commerce they are much broken and appear to have been beaten to extract the seed; they are marked by triple incisions. The seeds are reniform, very small, white or grey, a little over 1 millimetre long. The testa is composed of six-sided scale like cells, the albumen is oily, and encloses a curved embryo composed of two cotyledons and a radicle of equal length; the taste is sweet and oily.

Microscopic structure.—Malwa opium, macerated in glycerine, shows numerous prismatic crystals, some of them in tufted bundles, a few large, refractive globular bodies are seen, which have a resinous appearance, and here and there objects which appear to be starch grains; the remainder consists chiefly of amorphous particles, but mixed with them are some fragments of vegetable tissue (epidermis and fibre from the capsules).

Chemical composition.—According to Dr. Smyttan, formerly Opium Inspector at Bombay, the best Malwa opium yields 8 per cent. of morphia. Recent examinations of various kinds of opium, conducted in Professor Flückiger's laboratory, mostly by Dr. Buri, give a less favorable result. Professor Flückiger's report (Phar. Jour., April 24, 1875,) is as follows:—

I. Patna garden opium, 1838, wrapped in wax.—Under the microscope it is seen to consist for a large part of nice crystals, and to be devoid of starch. The crystals may partly consist of alkaloids, partly of sugar.

II. Medical Indian opium, 1852—1853, portion of a square brick.—It contains large crystals; no starch.

III. Abkari provision opium, Patna. No. 5380 (see also Pharmacographia, 49).—Small crystals; no starch.

IV. Garden Behar opium.—Exquisitely crystalline; no starch.

V. Malwa opium, portion of a flat cake.—This is not distinctly crystallized, and exhibits numerous starch grains, fraudulently admixed, starch not being a constituent of poppy juice.

VI. Sind opium, No. 28.—Large crystals.

VII. Hyderabad, Sind.

VIII. Opium from Khandeish.—Not distinctly crystallized, containing some starch.

IX. Persian opium, presented to me by Mr. Howard (1872).—Highly crystalline; no starch.

X. Egyptian Government opium, from Thebes, as exhibited in 1867, Paris Exhibition.—Not distinctly crystallized.

XI. Opium produced in 1823 at Playford, Suffolk.—Containing large crystals.

XII. English opium, 1859, from Mr. Morson.—Small crystals.

The process for the estimation of narcotine and morphine was that described in the Pharmacographia, p. 59. The extract *a* of the following table is that afforded by means of boiling ether, with which the powdered opium had almost absolutely been exhausted by repeating the treatment with ether from about twenty to thirty times. The extract remaining after the evaporation of the ether was boiled with acetic acid, 1·04 sp. gr. This liquid, after the acid had been driven off, yielded *b*, crude narcotine, as a crystalline brownish mass. It was washed with ether, and then afforded *d*, purified narcotine. Under *c* the difference between *a* and *b*, representing the amount of waxy matter, is calculated. It includes also the oily matter, with which the Persian opium, No. IX., is impregnated, as well as a little wax in the case of sample I.

In exhausting the opium with ether, a slightly yellowish fluid is obtained, which displays a bluish fluorescence, due to an unknown constituent of the drug.

Before precipitating the morphine, the aqueous solution was concentrated in order to get a smaller volume.

It afforded *e*, the crude, dried morphine, which, after twice or three times repeated recrystallization, finally furnished *f*, purified morphine. This purification of morphine cannot be performed without a loss of morphine; the real practical percentage of that alkaloid may therefore more correctly be regarded as somewhat superior to the figure *f*. It would be desirable to apply a process furnishing the exact percentage; yet there is, as far as I know, no such method thoroughly satisfactory. I have been struck with the very large discrepancy, in the Indian opium, of the figures under *e* and *f*, which, I think, is larger than in opium from Asia Minor. Another fact well worth considering is the usually low percentage of morphine of Indian opium, narcotine being frequently present to a larger amount. This has already been pointed out in the

Pharmacographia, page 57. It would appear, however, that this is of no consequence for the Chinese consumption, yet, possibly, it will be so some day if the home production of the Chinese further increases. Perhaps a more careful preparation of the Indian opium would at least prove of importance, not so much with regard to the smokers of the drug as to the possibility of extracting morphine from Indian opium profitably. It is not needful to point out that this would be highly desirable.

The results of the analysis just mentioned are the following:—

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.
a.—Ethereal extract, *i.e.*, residue dried after the evaporation of the ether	24·2	21·7	22·0	20·6	14·1	17 4	20·4	...	25·0	23·7	18·1	23·6
b.—Crude narcotine	10·0	9·0	8·5	7·6	7·6	8·0	9·7	...	10·2	12·2	9·3	11·6
c.—Wax; difference between *a&b*	14·2	12·7	13·5	13·0	6·5	9·4	10·7	...	14·8	11·5	8·8	12·0
d.—Purified narcotine	4·0	6·1	5·5	4·5	4·7	3·1	5·4	7·7	6·4	8·7	6·0	8·1
e—Crude morphine	11·2	11·2	14·1	10·6	14·4	...	...	...	...	...	...	...
f.—Purified morphine	8·6	4·3	3·5	4·6	6·1	3 8	3·2	6·07	7·1	5·8	4·3	8·3

The Malwa poppy capsules have been analysed by Lyon, of Bombay (1879), who obtained from them ·099 per cent. of alkaloids soluble in ether, consisting apparently of narcotine, ·023 per cent. of impure alkaloids soluble in benzol, and ·033 of impure alkaloids soluble in chloroform. Total amount of alkaloid ·16 per cent. about. No morphia could be detected in them by the ordinary reagents.

Commerce.—From 41,000 to 48,000 chests of Malwa opium are received every year in Bombay. The greater part is exported to China.

Value.—Opium, Rs. 10 to 15 per lb. Khaskhas, Rs. 3 to 3½ per maund of 37½ lbs. Poppy oil, 3½ annas per lb.

Papaver Rhœas, *Linn.*, *Bentl. and Trim.*, *t.* 19. The capsules.

Vernacular.—Janglí-Mudrika (*Bomb.*), Lálá (*Guz.*)

History, Uses, &c.—There is little to be found in Indian works about this poppy. It is the ῥοιάς of Theophrastus and probably the *μήκων ῥοιὰς* of Dioscorides.* The Khashkhásh-i-Mansúr of the Arabs and Persians may possibly be the same plant; it is described by them as hairy, leaves much divided, capsules small, called Mansúr, because it sheds its petals very quickly. In Guzerat P. Rhœas is grown in gardens, and is called Lálá by the Mahometans, who suppose it to be the Lálá of the Persian poets. The name Mudrika given to the capsules means "stamped with the Mudra or Seal," which is used by Hindus after bathing, and which resembles the capsule in shape. This seal is impressed upon the forehead, both temples, both breasts, both shoulders, and the pit of the stomach; that used by the followers of Vishnu is inscribed with the words, "Shri Narayen," and is dipped in Gopichandan, a kind of white clay, and that used by the followers of Shiva bears the words "Namás Shevaya," and is dipped in Bhasam (ashes of cowdung). Some of the Swámis, or religious teachers, use a red-hot Mudra to stamp their disciples with. The milky juice of the capsules has a narcotic odour, and slightly sedative properties.

Description.—The capsules are distinguished by their smooth globular form, those of P. dubium being twice as long as broad, and those of P. hybridum being bristly.

Chemical composition.—Hesse has obtained from the milky juice a colourless crystallizable substance, Rhæadine, $C^{21} H^{21} NO^{6}$, of weak alkaline reaction. It is tasteless, not poisonous, nearly insoluble in water, alcohol, ether, chloroform, benzol or aqueous ammonia, but soluble in weak acids; its solution in dilute sulphuric or hydrochloric acid acquires, after a time, a splendid red colour, destroyed by an alkali, but reappearing on addition of an acid. Owing to a statement made by Selmi that the capsules contain an alkaloid similar to morphia, Hesse has again examined them. He says:—"The juice collected in the morning under a clouded sky gave 35 °/o of dried residue at 100°. The milky juice is at first mostly white; sometimes citron yellow; Ferric chloride produces with it a deep red colour, which probably indicates the presence of Meconic acid. 4·4 grammes of dry residue gave no trace of morphia, or of a similar alkaloid, 0·090 gramme gave equal to 2·1 % of Rhæadine, and traces of another alkaloid. Rhæadine is not coloured by Ferric chloride, but resembles morphia in being almost insoluble in ether."—(Liebig's annalen d. chemie, Vol. clxxxv., p. 329.)

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* Theoph. Hist. Plant. ix. 13; Dios. iv. 62. Pliny also mentions the Rhœas or wild poppy, 19, 8; 20, 19.

Argemone mexicana, *Linn., Bot. Mag., t.* 243; *Wight, Ill., t.* 11. The juice and oil of the seeds.

Vernacular.—Bharbhand (*Hind.*), Brahma-dandí (*Sans.*), Shiál-kánta (*Bengal*), Dárúri (*Bomb*).

History, Uses, &c.—This is an American plant which has now run wild all over India; it may be easily known by its glaucous prickly thistle-like leaves, bright yellow flowers and yellow milky juice. The latter is used by the natives as an application to ulcers, and in combination with the juice of Aristolochia bracteata is given internally in syphilis and gonorrhœa. (Hove, Tours in 1787-88. Bomb. Govt. Records No. 16, New Series.) In the Concan the juice with milk is given in leprosy. The seeds and seed oil have been used by European physicians in India, and there has been much difference of opinion regarding their properties, some considering them inert, and others asserting that the oil in doses of from 30 to 60 minims is a valuable aperient in dysentery and other affections of the intestinal canal. The evidence collected in India for the preparation of the Indian Pharmacopœia strongly supports the latter opinion; my experience is also in favour of it; and Charbonnier, who examined the oil in 1868, found it aperient in doses of from 15 to 30 minims; possibly those who have used the oil unsuccessfully, purchased it in the bazaar, and were supplied with a mixed article; no bazaar-made oils can be relied upon. Since the publication of the first edition of this work further experiments with the oil fully confirm this opinion. The smallness of the dose required to produce an aperient action, and the absence of any disagreeable taste, will probably lead to a more extended use of it as a substitute for castor-oil. An extract made from the whole plant has been found to have an aperient action, and the milky juice to promote the healing of indolent ulcers. I have not noticed any bad effects from its application to the eyes. It use as an external application to the eyelids in conjunctivitis was probably introduced into this country with the plant by the Portuguese, who appear to have adopted it in Brazil as a substitute for the Argemone of the Greeks and Romans which was used for a similar purpose.*

For an interesting account of the properties of this plant, as observed in the West Indies by Hamilton, confer. Pharmaceutical Journal [i.], Vol. IV., p. 167.

Recently (1878) a case has occurred in Bombay in which a number of people suffered from vomiting and purging after using sweet oil which had been adulterated with Argemone oil. The adulteration may be detected by the rich orange red colour developed when strong nitric acid is added to Argemone oil, or to mixtures containing it.

Description.—The capsules are ¾ to 1½ inch long, terete, bristly, elliptic or oblong, and contain a number of dark brown rugose seeds, rather larger than black mustard. The oil has a bland nutty flavour; when first expressed it is sherry coloured, but becomes, after having been kept for some time, reddish brown.

Chemical composition.—The extract of the whole plant has been examined by Haines (1863), who was unable to find any alkaloid in it. Charbonnier (1868) found a small quantity of morphia (?) in the leaves and capsules. The seeds yielded him 36·2 per cent. of a drying fixed oil of a light yellow colour and bland taste. O. Frolich (1871) obtained from the oil a pretty hard soda soap, and found in the soap liquor, butyric, valerianic, acetic, and a little benzoic acid. According to Flückiger (1871) the oil has the specific gravity of ·919 at 16·5 C., remains clear at —·6 C., dries slowly and incompletely, is not soluble in 6 vols. of 90 % alcohol, as stated by Charbonnier and has a mild purgative effect in doses of 4 to 5 grammes. Dragendorff has found that the seeds contain an alkaloid which can be isolated in precisely the same way as morphia, and which agrees with it in all important reactions. He has not, however, had a sufficient quantity of it in his possession to make an ultimate analysis.

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* Dios. ii., 168, 169. Apul. Platonicus de Vir. Herb. 32.

Commerce.—Occasionally large parcels of the seed are offered for sale, but they are not easily placed, as the oil burns with a very smoky flame.

FUMARIACEÆ.

Fumaria officinalis, *Linn.*, *Eng. Bot.*, 589. The plant.

Vernacular.—Sháhterah (*Pers.*), Pitpápra, Sháhterah (*Hind.* and *Bomb.*)

History, Uses, &c.—The Pitpápra sold in Bombay does not appear to be the Fumaria parviflora, as it has a smooth fruit without a double pit at the apex; it is imported from Persia, and is doubtless F. officinalis. Several species of Fumitory have long been used medicinally, and were highly esteemed by the Greeks and Romans on account of their diuretic and alterative properties. Dioscorides calls the plant Kápnos,* and Pliny derives the name Fumaria from Fumus, smoke, with the explanation that the plant irritates the eyes like smoke; it has also been called Fumus terræ with reference to the colour of the foliage, or its smell. Fumitory does not appear to have been mentioned by the early Sanskrit writers. The Arabians and Persians probably derived their knowledge of it from the Greeks, as they hold the same high estimate of its properties. In the Makhzan-el-Adwiya two varieties are mentioned, one with violet-coloured flowers, and a large kind with white flowers; it is described as diuretic and alterative, removing hepatic obstructions, aperient and expellant of the humors, but more especially of Atrabilis; two Greek names are given, Kíasúsi and Káfnús; the Arabic names are Baklat-el-Malik, and Shahteraj, a corruption from the Persian. In India the drug is still highly esteemed by the Mahometans.

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* Dios. 4, 105. Plin. 25. 19; (ib. 25. 13, called Capnion). Sibthorp refers the *καπνος* of Dioscorides to F. parviflora, Lam., a plant with white flowers; probably both were used.

For a European account of the properties and uses of Fumitory, Handschuch "De plantis Fumariaceis," &c., may be consulted. Fumitory is laxative and diuretic; it is beneficial in dyspepsia depending upon torpidity of the liver and in scrofulous skin affections. Dose—2 ounces of the decoction (1 ounce to 1 pint) three times a day.

Description.—The dry plant is generally much broken up; mixed with it are many nearly globular, smooth, indehiscent capsules, the size of a large pin's head and umbilicate at the top, seed single, dark brown, crested, with a depression on one side; odour hardly any; taste bitter, slightly acrid and astringent.

Chemical composition.—Fumitory contains—1*st*, Fumaric acid, $C^4 H^4 O^4$, an acid isomeric with Maleic acid, differing from Malic acid by containing 1 at. less of water, and from Succinic acid by containing 2 at. less of hydrogen; it exists ready formed in several other plants, *viz.*, Corydalis bulbosa, Glaucium flavum, Lichen islandicus, and Boletus pseudo-ignarius; it is produced by the dehydration of Malic acid, by molecular transformation of Maleic acid, namely, when that acid is heated with hydriodic or hydrobromic acid (Kekulé, Ann. ch. Phar., Suppl. ii., 85), and according to Multhausen (Ann. ch. Phar. ci., 171), is found among the products of the oxidation of protein compounds by nitromuriatic acid. (See Watt's Dict. of Chemistry, Fumaric Acid.)

2*nd*, Fumarine, an organic base first observed by Peschier (Liebig's Organische chemie, p. 633), and more fully examined by Hannon (J. Chem. Méd. [3], VIII., 705). The plant gathered while in full flower, contains from 5 to 6 °/ₒ of this base, to which it appears to owe its specific physiological action. Fumarine is separated from its salts by caustic alkalies, or their carbonates in the form of a curdy precipitate; it may be obtained in the crystalline form by spontaneous evaporation of its hot alcoholic solution, but not by evaporation with the aid of heat; the salts have a bitter taste. (See Watt's Chem. Dict., article Fumarine.) According to Preuss, Fumarine crystallizes in irregular 6-sided, monoclinic prisms, soluble in alcohol, chloroform, benzol, carbon bisulphide, and amyl-alcohol, sparingly soluble in water, insoluble in ether; its composition has not been determined.

Commerce.—The drug is imported from Persia under the name of Shahterah. Value, about Rs. 4 per Surat maund of 37½ lbs.

Hypecoum procumbens, *Linn., Schk. Han.* 1, *t.* 27. Found in Sind, Afghanistan, and the Punjab salt range. The juice of the plant is said to have the same effects as opium, and the leaves to act as a diaphoretic (Murray). It appears to be the υπηκοον of Dioscorides.

CRUCIFERÆ.

Anastatica hierochuntina, *Linn., Jac. Vind.* 1, *t.* 58. The plant.

Vernacular.—Kaf Maryam, Kaf Ayesha (*Arab.*)

History, Uses, &c.—This is a small annual plant growing in sandy wastes in Syria. The earliest information we have concerning its history is a tradition that the plant expanded at the birth of the Saviour. Mahometan writers have appropriated this tradition in favour of Ayesha, the favourite wife of the Prophet and mother of the Faithful; the opening of the plant when wetted being considered symbolical of the opening of the womb in child-birth. The branches of Anastatica when in flower, spread out rigidly upon the ground, but when the seed ripens they curl up and form a round ball; this, when placed in water, expands, and the pods after a time open and discharge their seeds; the property of expansion when moist, and closure when dry, is retained for years. There can be little doubt that the dried plant was first introduced into India by the Mahometans; it is kept in all druggists' shops, and is prescribed in difficult labour, being placed in water until it expands, when the water is administered to the patient.

Description.—Stem short and woody, branched in a corymbose manner at the top; leaves obovate, the lower ones entire, the upper remotely toothed; flowers small, yellowish white, forming spikes along the branches; the fruit is a short pouch with a strong curved beak, and two ear-like projections on each side; it is divided into four cells, each cell containing a yellow concavo-convex seed. The whole plant is tomentose, and has hardly any taste; as seen in the shops, it presents the appearance of a little ball of wicker work about the size of a large egg at the top of the unbranched part of the stem.

Commerce.—It is imported from Syria by way of the Persian Gulf.

Lepidium iberis, *Linn.*, *Lob. Ic.*, *t.* 223. The seeds.

Vernacular.—Towdrí (*Pers.*)

History, Uses, &c.—These seeds are imported from Persia. In some English books upon Indian Materia Medica they are attributed to Malva sylvestris; in others to Cheiranthus cheiri; neither of these suppositions can be correct, as the parcels of seed, when they arrive in Bombay, contain corymbs of small pods, much like those of common Candytuft. Ibn Siná, quoting Dioscorides, describes توذري Tozeri as a plant like Farásiyún (πράσιον) with black seeds. (See Farásiyun.) Mír Muhammad Husain gives the following account of Towdrí:—"A Persian name, in Greek Arusíman,* Arabic Bazr-el-khumkhum, Bazr-el-hawah, and Kasísa; at Ispahan it is called Kadúma; in Kirmán, Márdarakht; at Tabriz, Darína. The plant has long leaves, without stalks; the branches are red, stiff, and armed with a few prickles; the seed is in a small pod, and of the shape of a lentil, but much smaller; there are three varieties—red, yellow, and white; the latter is the largest. Towdrí is hot in the second degree, and moist in the first: some say dry. Properties aphrodisiac, fattening the body, and purifying the blood," &c. The drug is in general use for the abovementioned properties, which are attributed by the natives to most of the cruciferous seeds. Some of the Towdrí seed is doubtless the produce of Lepidium iberis, Linn., a plant whose habitat extends from Southern Europe to Siberia. This plant was known to the ancients and employed as a rubefacient in rheumatism, &c.; the seeds taken internally were prescribed in bronchitis and dropsy.* According to Pliny they were first used by Damocrates.

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* ερύσιμον of Dios. is generally considered to be Sisymbrium officinale.

Description.—All three kinds are similar in shape to the seeds of Candytuft; the so-called white variety is only somewhat paler than the red; a brown-coloured sort is sometimes met with under the name of "Black Towdrí." When soaked in water the seeds become thickly coated with mucilage.

Chemical composition.—Leroux (1837) obtained from the flowering tops and seeds of Lepidium iberis an amorphous bitter principle which he named Lepidin. The plant also yeilds a sulphurated volatile oil.

Commerce.—It is imported from Persia. Value, Red, 3½ annas per lb.; White, 5 annas per lb.

Dr. Stewart states that in the Punjab and Sind Mathiola incana, R. Br.,† is grown for its seeds, which constitute one of the several kinds of "Todrí."

Lepidium sativum, *Linn., Zorn. Ic., t.* 16. The seeds.

Vernacular.—Hurf, Halím (*Hind.*), Assália, Ahalíva (*Bomb.*)

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* λεπιδίον Dios. ii. 165. ἰβηρίς said by Paulus Ægineta in his Third Book to be same as λεπίδιον. See Also Plin. 25, 8. App. Herb. 20 for Iberis, and Plin. 19, 8. for Lepidium. Sibthorp refers λεπίδιον to L. latifolium, L., and ἰβηρίς to L. gramminifolium, L. I think we may conclude that several species were used.

† Purple Gillyflower. *Eng. Bot.*, 1935.

History, Uses, &c.—The common cress is generally supposed to be a native of Persia, from which country it was probably introduced at an early date into India. The seeds are called Chandrasura in Sanskrit works, and are described as tonic and alterative; water, thickened with the mucilage which they give out, is recommended in the Bhavaprakása as a remedy for hiccup. The Mahometan writers identify cress with the *καρδαμον* of the Greeks,[*] and give Hab-el-Rashád as the Arabic name for the seeds, which they consider to be hot and dry in the third degree, and to have aphrodisiac and diuretic properties; they recommend them for the dispersion of certain chronic enlargements of the spleen, &c., and as an alterative in various diseased conditions supposed to be produced by cold humors. The volatile oil has been shown by Hofmann to consist of *a-toluonitril*, $C^6 H^5 CH^2 CN$; it is of a brownish yellow colour, sp. gr. 0·924; it congeals at 15°. Cress seeds are too well known to require description; they are imported into Bombay from Persia under the name of Assália. Value, Rs. 3¼ per maund of 37½ lbs.

Sisymbrium Irio, *Linn., Eng. Bot.* 1631; *Reich. Ic. Fl. Germ., t.* 75, *f.* 4408. The seeds.

Vernacular.—Khúbkalán (*Hind.*), Khákshí (*Pers.* and *Bomb.*), Rán-tikhí (*Mar.*)

History, Uses, &c.—There is no notice of this drug in the Hindu Materia Medica; it appears to have been introduced into the country by the Mahometans as a substitute for S. officinale, the *ερύσιμον* of Dioscorides,[†] and the Irio of Pliny,[‡] which is reputed to be good for asthma, hoarseness, or any debility of the throat or vocal organs; as also to promote expectoration. S. irio is common about London, where it is called London Rocket; it covered the ground in the spring after the great fire of London, and Hallen records that S. officinale springs up wherever houses have been burnt. It is a common weed in Persia, and is known by various names in different parts of the country, *e.g.*, in Fars, Shafterak; Khorasan, Khákshí; Tabriz, Surdan; Turkistan, Shiwaran; Mazenderan, Shalumbi. In Arabic it is called Khubah. Medicinally it is thought to be expectorant, stimulant and restorative; it is also used externally as a stimulating poultice; a large quantity is imported, as it is in constant demand among the Mahometans of this part of the country. The plant grows in Northern India, but the seed there produced does not come to Bombay.

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[*] Dios. ii. 144; Nasturtium of Pliny, 19, 8.

[†] Dios, 2, 147.

[‡] Plin. 22, 25. Sibthorp refers *ερύσιμον* to S. polyceratium, L.; probably more than one species was used under this name.

Description.—Khákshí is a small red oblong seed about 1-20th of an inch long, one surface is convex, the other grooved, the groove ending in a notch; when placed in water it becomes coated with a transparent mucilage; the kernel is yellow and oily, and turns rancid if the seeds are kept for any time; it has a hot flavour like mustard.

Commerce.—It is imported from Persia. Value, Rs. 5 per Surat maund of 37½ lbs.

Brassica nigra, *Koch., Bentl. and Trim., t.* 22. The seeds.
,, **campestris,** *Linn., Eng. Bot.* 2146. The seeds and oil.
,, **juncea** *H. f. and T., Jacq. Vind., t.* 171. The seeds.

Vernacular.—B. campestris, Surson (*Hind.*), Sherus (*Bomb.*), other varieties Rai (*Hind* and *Bomb.*), Kadugu (*Tam.*) Oil of B. campestris, Surson-ka-tel (*Hind.*), Sherus-ka-tel and Sherusel (*Bomb.*)

History, Uses, &c.—Mustard is mentioned by Greek writers as Napú and Sinípí, and appears to have been used by them as a medicine.* There is reason to suppose that the Romans used it as a condiment and medicine. Sanskrit writers notice two kinds, sidhartha or white mustard (B. campestris), and rajika or brown mustard (probably B. juncea). The first kind is almost exclusively used for the production of the expressed oil,* while the brown or black mustards are preferred on account of their greater pungency as rubefacients and for internal administration. Mustard oil is largely used as an article of diet, and when applied to the skin is considered to keep it soft, cool, and clean, and to promote the growth of hair. Internally the Hindus use mustard combined with other stimulants in dyspepsia and as an emetic; externally they use it in much the same way as we do in Europe, but with the addition of other drugs, most of them of doubtful efficacy. In the Concan the whole seeds, moistened in warm water and sprinkled with lime, are given as a remedy for dyspepsia. In the Makhzan-el-Adwiya three kinds of mustard are noticed. Wild mustard, with small round reddish brown seeds, and two sorts of cultivated mustard, the white and the red. The seeds of the latter are directed to be used for medicinal purposes; they are described as large and not round. The Mahometans consider mustard to be hot and dry, and to have detergent and digestive properties; they prescribe it internally in many diseases in which they think such remedies are indicated; externally they apply it in a variety of ways as a stimulant and counter-irritant. The list of diseases in which it is recommended, and the method of application or administration in each is too long to reproduce here. (Confer. Makhzan, article Khardal.) Mustard is grown in India together with wheat; it is produced in large quantities in Sind and Guzerat.

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* Dios. 2, 143.

Description.—Four kinds of mustard are generally to be found in the Bombay market, namely, 1*st*, Karachí mustard, B. nigra var (?)—Globular, of a dark brown colour, surface rough, generally covered with a white pellicle, giving the seeds a grey colour; size about $\frac{1}{16}$ of an inch in diameter.

2*nd*, Guzerat mustard, B. nigra—Seeds globular, dark reddish brown, clean and bright; size about $\frac{1}{25}$ of an inch in diameter; surface rough, but less so than that of the 1st kind.

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* Colza and Carcel oil of commerce.

3rd, Jumbusír mustard, B. juncea—Seeds oblong, light reddish brown, clean and bright; length $\frac{1}{12}$ of an inch; surface does not appear rough unless magnified.

4th, Sherus or rape, B. campestris—Seeds very slightly oblong, yellow, or reddish brown, clean and bright; diameter $\frac{1}{12}$ of an inch or more; surface smooth to the naked eye, but seen to be finely reticulated under a magnifying glass.

The third kind is preferred by the natives, and may be considered the officinal mustard of Bombay; it has a very bright rich yellow colour when powdered.

Microscopic structure.—The white pellicle which covers the Karachí seeds consists of hexagonal cells. The epidermis of the different kinds of seed consists of one row of closely packed cells, having strong lateral and inner walls; the cells are best seen in the Karachí mustard on account of their greater size.

Chemical composition.—For an account of the chemical oomposition of mustard the reader is referred to standard works on Materia Medica and Chemistry.

Commerce.—Mustard is imported into Bombay from Sind and Guzerat. The average prices are—Karachí, Rs. 22 per candy; Guzerat, Rs. 42 per candy; Jumbusír, Rs. 33 per candy; Sherus, Rs. 7 per cwt. The low price of Karachí mustard is due to the large quantity of dirt which is always mixed with it. Guzerat fetches a high price, as it is similar to the black mustard of Europe, and is therefore in request for exportation.

Raphanus sativus, *Linn., Lam. Ill., t.* 566. A large, coarse, white radish, is universally cultivated in this part of India. The seeds, *Vern.* Múlábíj, are used as a diuretic, laxative and lithontriptic; also the juice of the fresh leaves. The root and seeds yield with water a milky distillate, from which a small quantity of oil may be obtained by rectification; it is colourless, heavier than water, and has the taste but not the smell of radishes. The oil contains sulphur; it forms a white precipitate with corrosive sublimate and yellow with bichloride of platinum. It dissolves with tolerable facility in water.—(Pless in Gmelin's Handbook, 10, 56.)

CAPPARIDEÆ.

Cleome viscosa, *Linn.*, *Wight Ic.*, *t.* 2 ; *Rheede Hort. Mal. IX.*, *t.* 33. The plant and seeds.

Vernacular.—Húlhúl, Húrhúr (*Hind.*), Kánphútí, Pivala-tilávana (*Bomb.*), Nayavaylei (*Tam.*)

History, Uses, &c.—This common weed on cultivated ground appears to have been long in use in India as a domestic remedy; it is called in Sanskrit Adityabhaktá. Ainslie says :—"The small compressed, netted surfaced, hottish tasted seeds have got the Tamool name of Nahi Kuddághoo, or 'dog's mustard,' and are considered by the Vytians as anthelmintic and carminative ; they are administered in the quantity of about a tea-spoonful twice daily. In Dukhanie the seeds are called 'Chorie ajooan,' and in Arabic Bazr-el-Banj Chemar. The juice of the leaves, Rheede says, is useful in deafness poured into the ears." This account agrees with the way in which the plant is used at the present time in Bombay, the juice mixed with oil being a popular remedy for purulent discharges from the ear; hence the name Kánphútí.*

Description.—An annual weed from 1 to 3 feet high ; leaves 3 to 5 foliolate, leaflets obovate; flowers yellow; the whole plant pubescent and extremely viscid ; many of the hairs are surmounted by a round gland, from which a reddish viscid secretion exudes; the plant has a powerful odour like black currants. The capsules are from 2 to $3\frac{1}{2}$ inches long, striated, pubescent, tapering towards the point, which is surmounted by the style ; the seeds are dark brown or nearly black, reniform, and granular, about the size of black mustard seed ; the leaves have a pungent flavour, and the seed a feeble taste of mustard.

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* The juice of plants was used in this way by the Greeks and Romans. Scrib Larg. Comp. 39. Ad auriculæ et tumorem et dolorem sine ulcere prodest herbæ urceolaris, aut cucurbitæ ramentorum succus tepens per strigilem in foramen auris dolentis infusus.

Gynandropsis pentaphylla. *D. C., Rheede Hort. Mal. IX., t.* 34. The plant and seeds.

Vernacular.—Húrhúr, Húlhúl, Karaila (*Hind.* and *Beng.*), Tilávana, Máblí (*Bomb.*), Vaylí (*Tam.*)

History, Uses, &c.—The five-leaved Cleome, as it was formerly called, has been long known as a domestic remedy by the Hindus ; it is called in Sanskrit Surjavarta ; it is noticed by Ainslie, who says, "That the small, numerous, warmish kidney formed black seeds, as well as leaves of this plant, are administered in decoction in convulsive affections and typhus fever, to the quantity of half a teacup full twice daily." In Bombay the natives regard it as having much the same properties as Cleome viscosa.

Description.—A common plant on cultivated ground ; leaves 5-foliolate, with obovate leaflets; flowers white or purplish, in glutinous racemes, bracts 3-foliolate ; stamens very long, purple ; capsules 2 to 4 inches long, tapering towards the point, which is surmounted by the style, striated, pubescent. The whole plant is viscid and covered thickly with glandular hairs ; it has a strong peculiar odour like the black currant leaf. The seeds are black, of the same shape and size as those of Cleome viscosa, but rougher ; they have a very faint flavour of mustard.

Cratæva religiosa, *Forst., var. Nurvala ; Rheede Hort. Mal. III., t.* 42. The leaves and bark.

Vernacular.—Barun (*Hind.*), Hádavarna, Váyavarna (*Bomb.*), Narvala (*Tam.*)

History, Uses, &c.—This small tree is a native of Malabar and Canara, Tropical Africa, and the Society Islands ; it is also found planted about temples and Mahometan tombs in many parts of India. Ainslie appears to have confounded it with Ægle marmelos. It is worthy of remark that this tree is found planted near tombs in several different parts of the world. The Sanskrit names are Varuna and Asmarighna. Mr. U. C. Dutt gives the following summary of its properties as described in Sanskrit works :—"It is said to promote the appetite, increase the secretion of the bile, act as a laxative, and remove disorders of the urinary organs. In calculous affections it is used in a great variety of forms ; thus a simple decoction of the bark may be given with the addition of treacle. A compound decoction is prepared along with equal parts of Tribulus terrestris and ginger, and is administered with the addition of Yavakshára (impure carbonate of potash) and honey. A compound powder, *Varunadya churna*, is prepared as follows : A solution of the ashes of *Varuna* is made ; this solution is boiled with the addition of the bark in powder and Yavakshára till the water is entirely evaporated, the resulting powder is given in ascites, calculus, enlargements of the abdominal viscera, and affections of the bladder and uterus. A confection, called Varunádya guda, is prepared by adding to the fluid extract of the bark, treacle, and a number of diuretic and aromatic substances." In Bombay the leaves are used as a remedy for swelling of the feet, and a burning sensation in the soles of the feet, a common complaint of a somewhat obscure nature. The leaf-juice is given in rheumatism in the Concan in doses of ½ to 3 tolas mixed with cocoanut juice and ghi. In caries of the bones of the nose the leaf is smoked and the smoke exhaled through the nose. The bark and leaf pounded and tied in a cloth are used as a fomentation in rheumatism.

Description.—Leaves 3-foliolate, on long petioles, leaflets lanceolate acuminate, thin, smooth, upper surface dark green, under surface of a lighter colour, about 8 inches long and 3 inches broad. When bruised they have a disagreeable smell, something like Hellebore ; taste slightly bitter and very pungent, causing a tingling sensation in the tongue, not aromatic. The bark is grey externally, and minutely fissured, thick ; fracture short ; beneath the grey epidermis is a green layer, substance white, a transverse section shows numerous yellow specks, which, when examined with a lens, are seen to be bundles of very large liber cells. The taste is faintly bitter.

Capparis spinosa, *Linn.*, *Var.* 2 *rupestris*, *Sibth. Flor. Græc.*, *t.* 487. *Var.* 3, *vulgaris*, *Royle Illus.* 73. *Var.* 4, *leucophylla*, *Deless. Ic. Sel. iii.*, *t.* 10. The bark of the root.

Vernacular.—Kabar (*Arabic* and *Bomb.*)

History, Uses, &c.—This plant is widely distributed, being found in Afghanistan, West Asia, Europe, North Africa, Australia, and the Sandwich Islands. The common Indian and Oriental form, Var. 3 of Hooker's Indian Flora, grows on the Mahableshwar Hills. Caper bark does not appear to have been known as a medicine to the Hindus until introduced by the Mahometans, but another species of Capparis, C. aphylla, very common in India, and having somewhat similar properties, has a Sanskrit name (Karíra), and its berries are used by the natives. Capparis is mentioned by both Greek and Latin writers,* and its medicinal properties were probably made known to the Arabs through them. The Syrian name is Kabár and the Turkish Kabarish; in Persia it is called Kabar and Kúrak. The author of the Makhzan-el-Adwiya gives a good description of the plant, and says that the root bark is the most active part, and generally used. He considers it to be hot and dry, and to act as a detergent and astringent, expelling cold humors; it is therefore recommended in palsy, dropsy, and gouty and rheumatic affections; the juice of the fresh plant is directed to be dropped into the ear to kill worms, just as Cleome juice is used in India; all parts of the plant are said to have a stimulating and astringent effect when applied externally. Ainslie mentions the drug as an imported article, and notices its use as an external application to malignant ulcers.

Description.—Caper root bark occurs in half quills, several inches in length, it is very thick and transversely fissured; the external surface is grey, the internal white, taste bitter and pungent.

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* Dios. ii., 164. κάππαρις or κάππαρι. Plin 13, 23. Cels. 4, 9. Capparis.

Chemical composition.—The root bark is said to contain a neutral bitter principle of sharp irritating taste, and resembling senegin. The flower buds distilled with water yield a distillate having an alliaceous odour. After they have been washed with cold water, hot water extracts from them Capric acid ($C^{10} H^{20} O^{2}$), and a gelatinous substance of the Pectin group; Capric acid is sometimes found deposited on the calices of the buds in white specks having the appearance of wax (Rochleder and Blas).—*Vide* Watt's Dict. of Chem. under Capparis.

Commerce.—The drug is imported *viâ* the Persian Gulf. Value, Re. $\frac{1}{4}$ per lb.

The root of C. zeylanica, *Linn.*, *Vern.*—Wageti or Govindphal, is reputed to be a cooling medicine in the Concan.

VIOLACEÆ.

Viola odorata, *Linn.*, *Bentl. and Trim.*, *t.* 25. The plant and flowers.

Vernacular.—Banafshah (*Pers.*, *Hind.* and *Bomb.*)

History, Uses, &c.—The Greeks made use of this herb as a medicine,[*] and from them and their works the Mahometans probably became acquainted with its properties; it does not appear to have been used by the early Hindu physicians. A long account of its properties will be found in most Arabic and Persian works on Materia Medica; it is generally considered cold and moist, and is especially valued as a diuretic and expectorant, and as a purgative in bilious affections; it is seldom given alone, but is prescribed along with other drugs, which also have an aperient action, such as tamarinds, myrobalans, &c. The diseases in which Banafshah is recommended are too numerous to be mentioned here; suffice it to say that they are generally those in which a cooling treatment is thought to be indicated by the Hakims. The root has been tried by European Medical men in India as a substitute for Ipecacuanha, but, according to the Bengal Dispensatory, without satisfactory results. Native Doctors consider the purple-flowered variety to be the best; they use the flowers separately, and also the entire plant.

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[*] Dios. iv. 117. *ἴον μέλαν.* Viola, Latin, digammated from *ἴον* Plin. 21, 6.

Description.—The root is as thick as a small quill, very crooked, and furnished with a number of thin radicles; it has a spongy bark, and a hard woody meditullium; the colour is pale yellow; odour and taste not peculiar.

Chemical composition.—The flowers are said to contain besides colouring matter, slight traces of a volatile oil, two acids, one red and the other colourless, an emetic principle called Violin, and probably identical with emetin, sugar, and other substances. The colouring matter of the flowers is easily turned red by acids, and green by alkalies. The colourless acid called Violenic acid by Peretti, is said to crystallize in silky needles, to be soluble in water, alcohol, and ether, and to form yellow salts which stain the skin. According to Boullay all parts of the plant contain Violin. (Boullay, Recherches analytiques sur la Violette, Mémoires de l'Academie de Médicine, 1828, t. I., 417.)

Commerce.—Violet flowers (Gul-i-Banafshah) and the plant (Kashmiri Banafshah) are the two forms of this drug met with in the Bombay market; the first is generally imported from Persia, and consists of the flowers of the purple Violet; the second comes from Cashmere, and is the whole plant in flower; it seems to be a white or yellow flowered variety.

Ionidium suffruticosum, *Ging., Wight. Ill., t.* 19; *Ic., t.* 308. The plant.

Vernacular.—Ratanpuras (*Hind.* and *Bomb.*), Orilatamaray (*Tam.*)

History, Uses, &c.—I have been unable to find any account of the medicinal use of this plant in native works on Materia

Medica. Ainslie, however, mentions it, and gives the Sanskrit name as Chárati; it is therefore probable that some of the Hindu works current in Southern India may contain some information upon the subject. According to the writer just mentioned, the leaves and tender stalks are demulcent, and are used by the natives in decoction and electuary; they are also employed in conjunction with some mild oil in preparing a cooling liniment for the head; of the decoction about an ounce and a half is given twice daily. In the Bengal Dispensatory it is noticed as not containing any Violin. I have no knowledge of its use in Bombay, but the plant is found in the Concans.

Description.—Plant very variable, 6 to 12 inches, perennial, branches diffuse, woody; leaves from 1½ to 2 by $\frac{1}{12}$ to ⅓ inches, subsessile, stipules subulate, gland tipped; flowers red, pedicels shorter than the leaves, petals variable, 4 oblong acute or mucronate, the 5th with a long claw, and large oval or orbicular limb; seeds striate. (Hooker's Flora of British India, I., p. 185.)

BIXINEÆ.

Gynocardia odorata, *R. Br., Bentl. and Trim., t.* 28. The seeds.

Vernacular.—Chaulmogra (*Hind.* and *Bomb.*)

History, Uses, &c.—We know very little of the history of this drug, but it seems that the inhabitants of South Eastern Asia have for a long time been in the habit of using the seeds of this and of another nearly allied species as a remedy for leprosy. Hanbury has pointed out that a seed very similar to Chaulmogra is exported to China from Siam, under the name of Lukrabo, and that it differs from Chaulmogra in having a stronger testa. In the Makhzan-el-Adwiya there is a short notice of the seeds under the name of Chawul Mungri; their use in leprosy and other skin diseases is mentioned both as an internal and external remedy. In native practise the oil is administered mixed with clarified butter; this mixture is of a brownish yellow colour, and of the consistence of a soft ointment; it is often adulterated. Roxburgh, and the authors of the Bengal Dispensatory, briefly notice Chaulmogra, but of late years it has become better known to Europeans, and has been extensively used in many parts of India with a favourable result. In the Indian Annals of Medical Science, April 1856, it was brought to notice as a remedy for secondary syphilis. It was first given as a remedy for phthisis and scrofula by Dr. R. Jones of Calcutta, in doses of six grains three times a day. In 1868 it was made officinal in the Pharmacopœia of India, where an ointment is directed to be made from the pounded kernels mixed with Ung. Simplex. Within the last few years the oil has been used in several of the London hospitals as a remedy for stiff joints caused by rheumatism, being rubbed in, and also given internally in doses of 3 to 4 minims three times a day after meals; the dose may be gradually increased. For children 1 to 2 minims once a day is sufficient; it may be combined with cod-liver oil. Dr. Young, of Florence, has used the oil with advantage in macular and anæsthetic leprosy; during treatment bronchial affections disappeared. In America it has been used as a remedy for sprains and bruises and for sciatica; over-doses (10 minims three times a day) cause vomiting and purging with loss of appetite, but all people are not equally affected by the drug. In chest affections and phthisis it may be rubbed into the chest with advantage. People taking it should live generously; native Indian doctors recommend abstinence from meat, sweets, spices and acids during it use. Dr. Wyndham Cottle writes to the *British Medical Journal* on Chaulmogra oil and its active principle, Gynocardic acid, as internal and external remedies in various forms of skin disease. Gynocardic acid he finds preferable for several reasons, as it rarely produces nausea, can easily be given in the form of pills, and is more uniform. Both the oil and gynocardic acid are used either as external or internal remedies, the oil being taken best in perles; and the oil and the acid best applied as ointments in combination with vaseline. Dr. Cottle seems to have found the medicines most serviceable as local applications in eczema. In eczema of the face, and when it shows itself in dry patches, he has found an ointment of gynocardic acid of from 15 to 25 grains to the ounce of vaseline, almost a specific, when most of the ordinary applications in use only served to aggravate the local mischief. The ointment should be applied three or four times daily, so as to keep the affected parts lubricated with it. Again, in eczema of the hands, such an ointment is the most generally useful application with which he is acquainted. In the acute form of this disease, or where there is much discharge, the good effects following the use of Chaulmogra oil, or gynocardic acid, locally applied, are not so marked. For internal administration it is well to begin with about four minims of the oil, or half a grain of the acid, taken after food, twice or thrice daily, and gradually increased to from half a drachm to one drachm of the oil, or one to three grains of the acid. An aperient should be given at the same time if necessary. The oil may be given in emulsion; it is convenient to have the gynocardic acid made into pills containing half a grain of the acid, with three grains of extract of gentian, extract of hops, or conserve of roses. To commence, one such pill may be given thrice daily. The amount may be gradually increased to three or four pills for each dose. The writer adds that the constitutional effects of the drug may be produced by inunction, and he suggests that a soap in which gynocardic acid was incorporated would probably possess much of the soothing and remedial influence of the gynocardic acid, and prove useful in the treatment of many forms of skin disease.

Description.—The fruit is globular, from 3 to 5 inches in diameter, with a thick hard rough rind, and contains a number of irregularly ovoid seeds immersed in a scanty pulp. The seeds are from 1 to 1¼ inch long, more or less angular or flattened by mutual pressure; they average about 35 grains in weight. The testa is thin, brittle, smooth and of a dull grey colour; the albumen is copious, white when fresh, but brown in the dried seeds and oily, and encloses a pair of large, plain, leafy, heart-shaped cotyledons with a stout radicle; the odour of the seed is nauseous and peculiar. The oil is sherry-yellow. Sp. gr. ·9450 at 85° F.

Microscopic structure.—The testa consists of an outer and an inner layer of stone cells placed parallel to the surface of the seed, the space between them being occupied by two or three rows of similar cells, the long axes of which are arranged nearly at right angles to those of the exterior cells. (Moeller.) The albumen exhibits large angular cells containing fatty oil, masses of albuminous matter, and tufted crystals. Starch is not present.

Chemical composition, &c.—In the hydraulic press the seeds yield from 25 to 30 per cent. of oil, to ether 51·5 per cent., which turns green with the sulphuric acid test (confer. Phar. Journ., March 25, 1876), and deposits in cold weather a quantity of crystalline fat. A chemical examination of the oil, by Moss, has shown that the existence of any alkaloidal substance is doubtful, at least so far as to account for any medicinal efficacy. He finds it to contain a peculiar fatty acid, gynocardic 11·7 per cent., associated with palmitic acid 63·0 per cent., hypogœic acid 4·0 per cent., and cocinic acid 2·3 per cent., in combination with glyceryl as fats, and the two former in the free state as well. Gynocardic acid crystallizes in yellowish plates, melts at 85° F., has an acrid burning taste, probable formula $C^{14} H^{24} O^{2}$; it strikes a green colour with sulphuric acid. The chemistry of Chaulmugra has recently (1885) been investigated by E. Heckel and F. Schlagdenhauffen, who consider the following test to be characteristic of the oil. They direct the oil to be mixed with an ethereal solution of ferric chloride, and the mixture to be evaporated until the oil becomes of a dirty green colour; it is then allowed to cool, and a few drops of sulphuric acid are added, which produce a fine greenish-blue colour. The colouring matter may be dissolved out by chloroform, with which it forms a dichroic solution like that of chlorophyll. This solution gives a deep absorption band extending from 40° to 70° of the scale (the sodium-ray coinciding with 50°). In proportion as the solution is diluted the black band becomes fainter, until, with a very weak solution, only a narrow very pale band can be seen, extending between 40° and 48° of the scale.

The following is the result of the analysis of the seeds :—

Soluble in water	9·175	Glucose	0·50
		Fixed salts	1·114
		Albumenoid matters	1·2675
		Colouring matters, &c.	6·2935
Fatty matters soluble in Petroleum	30·120		30·120
Fatty matters soluble in Chloroform	0·505		0·505
Soluble in methylic alcohol	5·405	Glucose	0·54
		Albumenoid matters	0·4206
		Fixed salts	0·090
		Non-nitrogenized organic matters	4·3544
Residue insoluble in methylic alcohol	49·009	Albumenoid matters	23·8740
		Fixed salts	4·845
		Cellulose and other non-nitrogenized matters	20·290
Moisture	5·786		
	100·000		

—(*Journn. de Phar. et de Chim., April 1st,* 1885.)

Commerce.—The seeds come from Calcutta, and cost in Bombay about Rs. 15 per Bengal maund of 80 lbs. They are collected in the Lower Himalayas in December.

Hydnocarpus Wightiana, *Blume, Wight, Ill. i., t.* 16; *Rheede Hort. Mal. I., t.* 36. The seeds.

Vernacular.—Kadu-kavatha (*Bomb.*), Kosto (*Goa*).

History, Uses, &c.—All that we know of the history of this tree is that the seeds have long been used as a domestic remedy upon the Western Coast in certain obstinate skin diseases, and that the oil is expressed by the poorer classes for burning, and for use as a medicine. In scabby eruptions the oil mixed with an equal portion of Jatropha curcas oil, sulphur, camphor and limejuice, is rubbed in. For scald head equal parts of the oil and lime-water are used as a liniment. The oil has also a reputation in the Concan as a remedy for *Bursáti* in horses. Latterly the oil has been brought to the notice of Europeans as a substitute for Chaulmogra, and is being used in the Bombay Presidency with satisfactory results.

Description.—The fruit is globose, about the size of an apple; it has a rough, thick, brown rind, externally suberous, internally woody, which is generally studded with large tubercles, but non-tubercular fruit may be found on most trees. Within are about twenty obtusely angular seeds, ¾ of an inch in length, embedded in a scanty white pulp firmly adherent to the thin black testa. When the pulp is scraped off the outer surface of the testa is seen to be rough and striated by shallow longitudinal grooves; it has not the prominent ridges of H. venenata. Gärtn. Fruct. i., t. 60. Inside the shell is a copious oily albumen, containing two large, plain, heart-shaped, leafy cotyledons like those of Chaulmogra. The albumen, when fresh is white, but turns of a dark brown colour in the dry seeds; the odour resembles that of Chaulmogra. The oil is of a pale sherry colour. Sp. gr. ·9482 at 85° F.

Microscopic structure.—The testa and albumen present the same appearance as those of the Chaulmogra seed.

Chemical composition.—The oil gives the green colour with sulphuric acid which Chaulmogra does, but in a less degree. The production of this colour has been shown by Moss to depend upon the presence of gynocardic acid; during his experiments he found that palm oil produced a similar reaction. Gynocardic acid has an acrid burning taste, and appears to be the most important constituent of these oils. The oil has an odour like that of Chaulmogra, which it also resembles in colour; 150 lbs. in stock for more than 12 months did not give any crystalline fatty deposit.

Commerce.—The seeds are not an article of trade, but if ordered, may be obtained at about half the price of those of Chaulmogra.

Bixa orellana, *Linn., Bot. Mag.* 1456.

Vernacular.—Sendrí, Jáphar, Késrí.

The pulp surrounding the seeds (a well-known colouring matter) is astringent and slightly purgative. (Roxb.) The seeds are cordial, astringent and febrifuge. (Lindl.) When an alcoholic extract of Annatto is treated with sodium carbonate, a sodium compound of Bixin is formed, crystallising in leaflets having a coppery lustre; and from this salt, the colouring matter (Bixin) may be obtained in a crystalline form.

Cochlospermum Gossypium, *D. C., Wight in Hook. Bot. Misc. ii.,* 357, *Suppl., t.* 18. The gum.

Vernacular.—The gum, Katíra-i-Hindí (*Pers.* and *Hind.*)

History, Uses, &c.—This tree grows upon dry hilly ground in Garwhal, Bundelkund, Behar, and Orissa; it is also found in Khandesh, where it attains a large size; in Bombay it may be seen in gardens. The flowers are large and of a golden yellow colour, and appear in March and April, when the tree is destitute of leaves; the capsule is the size of a goose egg and filled with cotton; the seeds kidney-shaped or cochleate, with a hard testa. The gum is used in the Upper Provinces as a substitute for Tragacanth. The Katíra, or more correctly Kathíra, of Arabic and Persian writers on Materia Medica, is the true Tragacanth, and the name has been transferred to the gum of this tree by the Mahometan settlers in India. In Bombay the gum of Sterculia urens, called 'Karai gond' by the Guzerathi shopkeepers, is used as country Tragacanth, and is sold by Mussalman druggists as Kutíra.

Description.—White or yellowish, generally in large vermicular pieces, transversely fissured, and showing a tendency to split up into flat scales, sometimes in large flat pieces like Tragacanth; when moistened it swells up into a bulky transparent jelly, which may be diffused in a large quantity of water, but is only very sparingly soluble. Its solution in water is neutral; the portion insoluble in water yields with alkalies a thick mucilage of a pinkish colour, which, according to Mitchell (1880), is not precipitated by acids.

Flacourtia Cataphracta, *Roxb., Rumph. Amb., Cap.* 43, *p.* 38; *XIX., t.* 1, 2. The fruit.

Vernacular.—Paniála (*Hind*), Jaggam (*Bomb.*)

History, Uses, &c.—This is the Práchinamalaka of Sanskrit writers; it appears to be doubtful whether it is a native of India, as it is generally met with in a cultivated state. The author of the Makhzan-el-Adwiya speaks of two kinds of Paniála, one cultivated and the other wild. He describes the fruit as being like a plum, but differing from it in having 5 to 6 stones instead of one, and suggests that this difference may be due to the impurity of the atmosphere of Bengal operating upon the plum tree of Persia. The Bombay name Jaggam appears to be a corruption of Jangomas. Dalzell and Gibson consider the tree to be truly wild in the Southern Concan; in Bombay it is cultivated. The fruit is recommended as useful in bilious conditions; and, like most acid fruits, it no doubt relieves the nausea and checks the purging.

Description.—The fruit is the size of a plum, purple, and acid; it is indehiscent, with a hard endocarp; seeds 5 to 6, obovoid; testa coriaceous; cotyledons orbicular.

FICOIDEÆ.

Trianthema obcordata, Roxb. T. monogyna, *Linn., Her. para.* 2, *t.* 213; *Wight Ic., t.* 228.

Vernacular.—Khápra.

History, Uses, &c.—This plant is also called Sveta Punarnavá, or white Boerhaavia. Both plants generally grow in the same localities and have a similar appearance. The root is cathartic and is used in powder. (S. Arjun, Bomb. Drugs, p. 61.)

Description.—Perennial, stems diffuse, prostrate; leaves one of each pair larger, obovate or obcordate, the other smaller and oblong; flowers solitary sessile, nearly concealed within the broad sheath of the petiole; stamens 15 to 20; style simple; capsule 6 to 8 seeded, lid concave, including 2 seeds; seeds black, muricated; leaves often with red margins. A common weed on rice fields. (Bomb. Flora.)

Mollugo stricta, *Linn., Rheede Hort. Mal. X., t.* 26.

Vernacular.—Zharas (*Bomb.*)

History, Uses, &c.—Is a small spreading bitter plant, which is highly esteemed by the Hindus as a bitter vegetable, which they eat occasionally on account of its stomachic, aperient, and antiseptic properties. An infusion of the plant is given to women to promote the menstrual discharge.

Description.—Glabrous, stems decumbent, leafy, angled; leaves slight glaucous, obovate-obtuse, mucronulate, tapering at the base; panicles elongated; many flowered; stamens usually three; seeds minutely tuberculated.

PORTULACEÆ.

Portulaca oleracea, *Linn., Plant. Grass.* 123.

„ **quadrifida,** *Linn., Jacq. Col. II., t.* 17, *f.* 4.

Vernacular.—Lonia (*Hind.*), Kurfáh (*Pers.* and *Bomb.*), Passelie Keeray (*Tam.*)

History, Uses, &c.—The creeping annual Purslane has probably been long used as a domestic remedy by the Hindus.

The Sanskrit name is Loní. The fresh leaves are acid, and are prescribed when bruised as a cooling external application in erysipelas, and an infusion of them is given as a diuretic. In Arabic and Persian works the herb is called Baklat-el-Humaka or Baklat-el-Mubarika and Kurfah; two kinds are described, the large and the small. The former is probably the P. oleracea, as its use as a vegetable is noticed. Both kinds are said to be cold and moist, and to have detergent and astringent properties. Portulaca is the ανδραχνη of Dioscorides ii., 113, and is mentioned by Celsus 2, 33, who calls it Portulaca, and by Pliny 25, 13, who calls it Andrachne. The plant and seeds are recommended in a great many diseases of the kidneys, bladder, and lungs, which are supposed to be caused by hot or bilious humours. They are also praised as an external application in burns, scalds, and various forms of skin disease. Ainslie mentions P. quadrifida and P. oleracea as being used in Southern India by Tamil physicians. These herbs can be obtained in most vegetable markets, and the seeds of P. oleracea are kept in the druggists' shops.

Description.—The two Portulacas, called Barra and Chota Lonia in Hindustani, may be readily recognised by their low growth, succulent, flat or nearly cylindrical leaves, and small yellow flowers; in P. quadrifida there are tufts of bristles in the axils, the seeds are black, minutely tubercled, and kidney-shaped; those of P. oleracea are much the largest.

TAMARISCINEÆ.

Tamarix gallica, *Linn.*, *Wight. Ill.*, *t.* 24 *A*; Var. ramosissima, *Ledeb. Ic. Fl. Ross.*, *t.* 256. The galls and manna.

Vernacular.—The galls, Barrí Main (*Hind.*), Samrat-ul-Turfah (*Arab.*), Magiya-main (*Bomb.*), Gazbar, Gazmázú (*Pers.*); the manna, Gazangabín and Gazanjabín (*Arab.*, *Pers.* and *Bomb.*)

History, Uses, &c.—This small tree or bush is widely distributed in Europe, Africa, and Asia. Dioscorides, speaking of μυρίκη says that in Egypt and Syria it bears a seed like a gall-nut, which is used as an astringent. (I., 101.) Pliny calls the same tree Tamarice (13, 21; 24, 9). It is the Tamarix of Columella (8, 15). In Sanskrit it is called Shavaka, and in Hindustani Jhau. The galls have probably long been used in Northern India as a substitute for the true gall. The manna is not produced in India, but in Persia and Arabia; in the month of June it drops from the tree, and is collected. In Persian works the galls of the Tamarix are called the fruit, and the manna is described as a dew which falls upon this and other trees, notably the willow and oak, and becomes solidified. The Hakíms consider the manna to be detergent, aperient, and expectorant. It is probably the δροσομελι of Galen and the *Rosmelleus* of Ibn Baitar.

Description.—The galls are much smaller than true galls, 3-angled, and knotty; in the centre is a cavity which sometimes contains the fly, but generally only excrementitious matter. The manna occurs in small grains, which are nearly white when fresh, but in this climate have a tendency to liquefy and form a thick yellow fluid like honey; it is produced upon Tamarisk, willow and oak, in consequence of the puncture of an insect. According to Ehrenberg, the insect which attacks the Tamarisk is the Coccus manniparus. The name Gazangabín signifies Tamarisk-honey, and is used, according to Haussknecht, at the present time in Persia to designate a manna collected in the mountain districts of Chahar-Mahal and Faraidan from two species of Astragalus (confer. Pharmacographia, p. 371). This account agrees with that found in Persian works on Materia Medica, which describe Gazangabín as the produce of several trees. Rich (Residence in Koordistan, Vol. I., p. 142,) describes the collection of Gazangabín, called by the Koords Ghezo, by picking the leaves of the trees, letting them dry, and then gently threshing them over a cloth. The season commences about the end of June.

Chemical composition.—Tamarisk manna from Sinai, examined by Berthelot, was a thick yellow syrup, and was found to consist of cane sugar, inverted sugar (levulose and glucose), dextrin and water, the last constituting one-fifth of the whole. A specimen of Persian Gazangabín yielded to Ludwig, dextrin, uncrystallizable sugar and organic acids.

Commerce.—Gazangabín is imported into Bombay from Persia. Value, Re. ½ per lb.; it is kept in most druggists' shops. The galls are sometimes abundant; at others unobtainable. Value, Rs. 12 to 13 per maund of 37½ lbs.

Tamarix articulata, *Vahl. Symb. ii,* 48, *t.* 32. The galls.

Vernacular.—Chotí Main (*Hind.*), Samrat-el-Asl (*Arab.*), Magiya-main (*Bomb.*), Gazbar and Azbah (*Pers.*)

History, Uses, &c.—The tree is abundant in Sind and the Punjab, and is often cultivated. The galls are made use of as a substitute for true galls, a description of their properties and uses will be found in Arabic and Persian works under the name of Sumrat-el-Asl; these do not appear to differ in any important particular from the uses to which common galls are applied.

Description.—These galls are smaller than those of T. Gallica, and are not 3-angled; they are round, knotty, of the size of a pea, and of a yellowish brown colour.

Chemical composition.—Tamarisk galls do not appear to have been particularly examined.

Commerce.—Small Tamarisk galls are occasionally met with in the drug market in large quantities, but they are often not obtainable. Value, Rs. 12 to 13 per maund of 37½ lbs.

GUTTIFERÆ.

Garcinia Indica, *Chois, Bent. and Trim., t.* 32. The fruit, seeds, and bark.

Vernacular.—The fruit, Amsúl, Kokam (*Bomb.*), Brindao (*Goa*); the oil, Kokam cha tel (*Bomb.*); the bark, Ratambasála (*Bomb.*)

History, Uses, &c.—The tree, *Ratamba,* is common on the Western coast between Damaun and Goa; it grows wild upon the hills of the Concan, but is often to be seen in gardens close to the sea. It flowers about Christmas, and ripens its fruit in April and May. The fruit is largely used all along the Western coast as an acid ingredient in curries, and is an article of commerce in the dry state. It is generally prepared by removing the seeds and drying the pulp in the sun; the latter is then lightly salted and is ready for the market. In Goa the pulp is sometimes made into large globular or elongated masses. The seeds are pounded and boiled to extract the oil, which, on cooling, becomes gradually solid, and is roughly moulded by hand into egg-shaped balls or concavo-convex cakes. This is the substance known to Europeans as *Kokam butter*. The natives occasionally use it for cooking, but the statement that it is largely used in Goa to adulterate ghí (liquid butter) is incorrect. In the first place no ghí is made in Goa, the bulk of the inhabitants, who are Christians, obtain their ghí (lard) from the pigs which abound in that territory, and the Hindus use oil, or, if wealthy, import ghí from Bombay. So few cattle are kept in Goa that it is difficult to obtain milk, and still more so butter. The juice of the fruit is sometimes used as a mordant in dyeing, and the apothecaries of Goa prepare a very fine purple syrup from it, which is used in bilious affections. Nothing seems to be known of the history of the Kokam fruit before the time of Garcia d'Orta (1563), who found it in use at Goa, under the name of Brindao, when he visited that city; the same name is still used by the native Christians. As it was an article of export in Garcia's time, there can be little doubt that it was used in Western India long before the Portuguese visited the country, just in the same manner as it is at the present day. Kokam butter appears to have first attracted the notice of Europeans about 1830 as a remedy for excoriations and chaps of the skin; in order to apply it, a piece is partially melted and rubbed upon the affected part. It is also of great value for the preparation of Nitrate of Mercury ointment, which if made in the usual manner is too fluid for hot climates; Indian lard being very fluid, equal parts of it and Kokam oil will be found to make an ointment of good consistence and colour which keeps well. The bark is astringent, and the young leaves after having been tied up in a plantain leaf and stewed in hot ashes, are rubbed with cold milk and given as a remedy for dysentery.

Description.—The fruit is spherical, about the size of a small apple, purple, containing an acid pulp of a still deeper colour, in which from 5 to 8 reniform seeds are embedded; the seeds are compressed laterally, wrinkled, about $\frac{3}{4}$ of an inch long by 4-10ths broad; the cotyledons are very thick, closely adherent and have a sweet oily taste. Kokam butter is of a greenish white colour, firm, dry and friable in the hottest weather, and greasy to the touch like spermaceti; its structure is crystalline; it generally contains impurities, and requires to be remelted and strained before it can be used for Pharmaceutical purposes; the residue after this process consists chiefly of particles of the fruit and seed.

Microscopic structure.—The cotyledons are composed of large reticulated cells containing crystalline fat.

Chemical composition.—Flückiger and Hanbury give the following account of it:—"Purified Kokum butter, boiled with caustic soda, yields a fine hard soap, which, when decomposed with sulphuric acid, affords a crystalline cake of fatty acids weighing as much as the original fat. The acids were again combined with soda, and the soap having been decomposed; they were dissolved in alcohol of about 94°/.. By slow cooling and evaporation, crystals were first formed, which, when perfectly dried, melted at 69·5° C.; they are consequently Stearic acid. A less considerable amount of crystals which separated subsequently had a fusing point of 55° C., and may be referred to Myristic acid. A portion of the crude fat was heated with oxide of lead and water, and the plumbic compound dried and exhausted with ether, which after evaporation left a very small amount of liquid oil, which we refer to Oleic acid. Finally the sulphuric acid used at the outset of the experiments was saturated, and examined in the usual manner for volatile fatty acids (butyric, valerianic, &c.), but with negative results.

" The fat of the seeds of G. Indica was extracted by ether and examined in 1857 by J. Bouis and d'Oliveira Pimentel. It was obtained to the extent of 30%, was found to fuse at 40° C., and to consist chiefly of stearin (tristearin). The seeds yielded 1·72 % of nitrogen. Their residue after exhaustion by ether afforded to alkaline solutions or alcohol a fine red colour." The dried fruit sold in the bazaar as kokam has been examined by Lyon (1881) with the following results:—Moisture 37·04 %; hot water extractive, 42·90 %; cellulose, 5·52 %; insoluble residue, 14·54 %. Hot water solution bright red and very acid, turns bluish green on addition of alkalies in excess; acidity due to Malic acid. Tartaric acid either absent or traces only present. No Citric acid. Fixed free acidity = 13·537 % Malic acid. Total ash 7·88. Insoluble in water 1·96; soluble in water 5·92. Chlorine of soluble ash as Na Cl =4·62 %. Alkalinity of soluble ash as potash=0·79 %.

Note.—The Chloride of Sodium is probably introduced when the kokam is salted.

Commerce.—The dried fruit comes from Goa, Hingoli and Malwan. Value, Rs. 40 per kandy of 28 Bombay maunds of 28 lbs. each.

Kokam butter comes from Goa. Value, Rs. 5 to 7 per Surat maund of 37½ lbs.

Garcinia xanthochymus, *Hook. f. Roxb. Cor. Pl. II.*, 51, *t.* 196.

Vernacular.—Oth., produces a yellow fruit the size of a small apple and very acid, which is used for the same purposes as that of G. indica; it is dried and made into a kind of Amsúl. In bilious conditions a sherbet made with about 1 oz. of the amsúl with a little rocksalt, pepper, ginger, cummin and sugar, is administered.

Garcinia mangostana, *Linn., Bot. Cab.* 845. The rind.

Vernacular.—Mangustan (*Bomb.*)

History, Uses, &c.—The rind of the well-known mangosteen fruit is brought to Bombay from the Straits and Singapore, and is a popular remedy for diarrhœa and dysentery.

Dr. S. Arjun, of Bombay, has found it very useful in the chronic diarrhœa of children. It has also been used as a febrifuge. The fruit is too well-known to require description.

Chemical composition.—W. Schmidt has obtained a crystallizable substance, *Mangostine*, $C^{20} H^{22} O^{5}$, from the rind of the fruit. To obtain it the rind is first boiled in water to remove tannin, and afterwards exhausted by boiling alcohol; upon evaporation of the alcoholic extract, a yellow amorphous mass is obtained, which consists of Mangostine and resin; this is redissolved in boiling alcohol, and water added to the boiling solution as long as it causes a precipitate of resin. From the solution on cooling mangostine is obtained in small yellow scales; it may be purified by resolution in alcohol and precipitation by subacetate of lead; remaining traces of resin are removed by the addition of water to the alcoholic solution, and finally, after several recrystallizations from weak alcohol, the mangostine is obtained in thin golden yellow scales, which are tasteless, and fuse at about 190° C.; at a higher temperature it is decomposed, a portion subliming unchanged. Mangostine is insoluble in water, but readily soluble in alcohol and ether; its solutions are neutral, hot dilute acids dissolve it without change, hot concentrated nitric acid converts it into oxalic acid, sulphuric acid forms with it a deep red solution and chars it if heated. It forms yellow solutions with alkalies. It reduces solutions of the noble metals, and turns perchloride of iron of a dark green colour, which is removed by the addition of an acid. (Ann. der Chem. und Pharm., t. xciii., p. 83; also Wurtz, Dict. de Chim., t. ii., p. 310.)

Garcinia Morella, *Desrouss., Bentl. and Trim., t.* 33; *Wight Ic., t.* 102. The gum-resin.

Vernacular.—Ussárah-i-Rewand, Gotáganba (*Pers., Hind.* and *Bomb.*), Mukkí (*Tam.*)

History, Uses, &c.—The Gamboge tree of Malabar and Canara, which is also found in other parts of India, is by Beddome called G. pictoria and kept distinct from G. Morella. Hooker considers them both to be the same species. There would seem to be no doubt that Gamboge has never been collected in India as an article of commerce, and that it is only from a comparatively recent date that the drug has been known in this country. The Ussárah-i-Rewand of Arabic and Persian books is, properly speaking, an extract of Rhubarb, as the name implies, but owing to a similarity in properties and also in colour, the same name was applied to Gamboge upon its becoming known as an article of commerce. The juice of G. Morella must have attracted the attention of the natives in the localities where the tree is found, and is very likely to have been used to a limited extent as a pigment, and, perhaps, as a medicine; but even at the present time the Indian product is not a commercial article, Siam Gamboge being the only kind obtainable in the drug markets. An interesting account of the history of commercial Gamboge will be found in the Pharmacographia, from which it appears that it only became known to the Chinese about A. D. 1300, and was not introduced into Europe before 1603. Reudenius (1614—1625) described its medicinal properties and recommended its use as a purgative in arthritis (gout).

Description.—Through the kindness of Dr. Davies, Civil Surgeon, Canara, I have received a specimen of Gamboge collected there. It is in irregular fragments, and appears to have been collected upon leaves, portions of which still adhere to it. The finer pieces have the colour and consistence of Siam Gamboge, but contain many impurities, such as portions of wood and leaves. Fully half the sample is of a dirty yellowish brown colour, and has a spongy structure; this portion, treated with rectified spirit, gives a clear deep orange solution like ordinary Gamboge, but leaves a copious greenish yellow marc, which appears to be chlorophyll. As at present collected, this Gamboge is too impure for commercial purposes.

Chemical composition.—Indian Gamboge has been found by Christison (1846) to be essentially the same as that of Siam. It has also been examined by Broughton (1871), who is of opinion that it is equal to that of Siam.

Commerce.—In the Bombay market the ordinary pipe Gamboge is alone met with. Price, Re. 1¼ per lb.

Mesua ferrea, *Linn., Wight Ill., t.* 127; *Ic., t.* 118. The flowers.

Vernacular.—Nágkesar (*Hind.* and *Beng.*), Nágchampa (*Bomb.*)

History, Uses, &c.—This beautiful tree, with its large Cistus-like white flowers, is found in the Southern Concan and Goa territory, but is much more abundant further south. The dried blossoms are known as Nágkesar (Cobra's saffron); they are prescribed by Hindu physicians as an adjunct to medicinal oils on account of their fragrance, and are also considered to have astringent and stomachic properties. Powdered and mixed with ghí (liquid butter) they are recommended by most of the later Hindu writers in bleeding piles, and burning of the feet. The root bark of Mesua ferrea contains much resinous juice, which exudes freely when it is wounded; it has a reddish brown epidermis, consisting of ten or more rows of brick-shaped cells, full of condensed resin. Within the epidermis is a variable number of rows of cells of the same shape, yellow, refractive, and containing resinous juice; the medullary rays are also yellow and refractive; there are numerous large laticiferous vessels; the bark is mildly astringent and feebly aromatic, but is not bitter as stated in the Pharmacopœia of India. The oil of the seeds is used as an embrocation in rheumatism; it is of a chestnut brown colour, sp. gr. 0·954, and solidifies at 5° (Lepine).

Description.—The flowers are about 3 inches in diameter, sepals orbicular, thick, with membranous margins, inner pair largest; petals 4, spreading, cuneate-obovate, pure white; anthers large, oblong, golden yellow. Fruit ovoid, conical-pointed, size of a large chestnut; base surrounded by the persistent sepals, 1 to 4 seeded; seeds dark-brown, testa smooth.

Commerce.—True Nágkesar is not an article of commerce in Bombay. The oil of the seeds is sometimes offered for sale.

Ochrocarpus longifolius, *Benth. and Hook., Wight Ill. i.,* 130; *Ic. t.* 1999. The flower buds.

Vernacular.—Punág (*Mar.*), Támbra-Nágkesar (*Bomb.*)

History, Uses, &c.—The dried buds of this tree are known in commerce as Támbra Nágkesar (red Nágkesar). The tree grows in the forests of the Western Peninsula from Canara to the Concan, and is called Suringi by the Marathas; the buds are used chiefly for dyeing silk, but have also astringent and aromatic properties, and are sometimes prescribed medicinally. The fruit is eaten by children, who call it gori-undi, or sweet undi. The seed, which is as large as an acorn, exudes a viscid gummy fluid when cut.

Description.—Flower two-thirds of an inch in diameter, on nodes clothed with subulate bractioles in the axils of fallen leaves; buds globose; pedicels 1 inch, slender; calyx bursting into 2 valves, reflexed during flowering; petals 4, thin, deciduous, white; stamens many; style subulate; stigma broad, discoid. The flowers are often hermaphrodite in cultivation. The dried buds are of a reddish brown colour and of the size of a small clove.

Commerce.—Nágkesar comes principally from Rajapur and the Deccan. Value, Rs. 2-12 to 3 per maund of 28 lbs.

Calophyllum inophyllum, *Linn., Wight Ill. i.,* 128; *Ic. t.* 77. The oil of the seeds.

Vernacular.—Sultán Champa (*Hind.*), Undi (*Bomb.*), Punagam (*Tam.*)

The oil, Sarpan-ka-tel (*Hind.*), Undi-che-tel (*Bomb.*)

History, Uses, &c.—This tree, wild, or in a cultivated state, is widely distributed throughout India; it abounds on the Western coast, where a greenish-coloured oil is expressed from the seeds, which is used for burning by the poorer classes, and is valued as an application for rheumatism, either alone or mixed with an equal portion of Hydnocarpus oil; it is also used as an application to exanthematous eruptions, and the seeds pounded with cashewnut seeds, borax and sparrow's dung are applied as a *lép* to boils to hasten maturation. The pounded bark is applied to swelled testicles. The tree when wounded exudes a small quantity of bright green resin, which is not collected, nor does it appear to be made use of in any way. This substance is soft and entirely soluble in rectified spirit; it has a parsley odour, and has been confounded with Tacamahaca, the exudation of C. Calaba, not a native of India. I have met with no mention of Calophyllum inophyllum in native works on Materia Medica. Ainslie notices it, but his account is confused and in some respects incorrect. Rheede says that the resin is emetic and purgative; his expression is, 'the tears which distil from the tree and its fruit'; this is quite correct, as small tears of resin may often be seen adhering to the fruit.

Description.—The fruit is ovoid, and greenish-yellow when ripe; it varies in size; on old trees it is often as large as a bantam's egg; the pulp surrounding the nut dries up when the seed is mature, and the previously smooth skin covering it becomes brown and much wrinkled; the endocarp is hard, woody, and white, as thick as the shell of a filbert; within it is an inner endocarp, soft, and corky, of a red colour, thicker than the woody shell towards the apex of the fruit, but gradually becoming very thin towards the base, the inner surface of this layer is highly polished. The seed is of the same shape as the nut; it is very oily and has a rancid taste; it consists of two cotyledons very closely united; under the microscope a stroma of small ovoid cells is seen, through which numerous large vessels loaded with green oil run in a longitudinal direction.

Chemical composition.—The resin melts easily and dissolves completely in alcohol; according to Sommer it does not yield umbelliferone by dry distillation. The oil of the almonds is greenish yellow, bitter and aromatic, sp. gr. 0·942; it solidifies at + 5° (Lepine).

Commerce.—The oil is not an article of commerce in Bombay, but the country people express it for burning, and use it medicinally. In Ceylon it is known as Domba oil.

Calophyllum Wightianum, *Wall., Wight Ill. i.,* 128; *Ic. t.* 106. This tree is abundant in Canara, where it is called Babbe, but does not appear to be found in other parts of the Bombay Presidency. The gum occurs in large translucent irregular lumps of a yellowish colour; it is of horny texture, somewhat brittle, without odour; the taste is soapy. When placed in water it gradually softens, and finally disintegrates into a fine granular matter which floats in the form of flaky particles of a dirty white colour, and numerous oil globules which gradually collect upon the surface; the water dissolves a small portion and becomes slightly viscid.

Calophyllum tomentosum, *Wight, Beddome Fl. Syl. Gen. xxii., t.* 2; *Wight Ic., t.* 110. The gum of the Poon, or Sirpoon, as it is also called (*Mar.* पुनई) is black and opaque, and much mixed with pieces of corky bark; it has a feebly astringent taste, and is very soluble in cold water, to which it yields a yellow brown solution exhibiting a strong blue fluorescence. If the gum is steeped in water for some time the solution becomes very dark in colour. Alum followed by carbonate of soda throws down apparently some of the brown colouring matter without interfering with the fluorescence, as after precipitation the solution although lighter in colour is very strongly fluorescent.

A solution purified by alum in this way has its fluorescence immediately destroyed by acids and restored again by alkalies. Examining its absorption spectrum it is found that while fluorescent the solution gives a broad absorption band at the violet end of the spectrum extending to about G.; this band disappears on destroying the fluorescence by acids, but reappears on the addition of alkalies. The solution of the gum does not appear to rotate polarized light. The gum itself communicates only a very faint fluorescence to rectified spirit. (Lyon.) I do not know whether this gum or that of C. Wightianum is applied to any industrial or medicinal use, but as both are collected by the natives, it is probable that they are supposed by them to have some medicinal virtues.

DIPTEROCARPEÆ.

Dipterocarpus turbinatus, *Gärtn. f. Fruct III.* 51, *t.* 188; *Roxb. Corom. Pl. III.* 10, *t.* 213.
„ **incanus**, *Roxb.*
„ **alatus**, *Roxb.*, *Gärtn. f. Fruct III.* 50, *t.* 187.

The oleo-resin.

Vernacular.—The Balsam, Garjan-ka-tel (*Hind.*, *Bomb.*, *&c.*)

History, Uses, &c.—Seventeen species of Dipterocarpus are noticed in Hooker's "Indian Flora" as growing in India and the Eastern Islands, but the three placed at the head of this article produce most of the Garjan Balsam of commerce. The Balsam does not appear to have been made much use of as a medicine by Hindus or Mahometans, for I have not found it noticed at any length in their standard works on Materia Medica. Under the name of Duhn-el-Garjan, a short notice of it will be found in the Makhzan. Ainslie mentions its use by the natives of Southern India in gonorrhœa. It was first brought prominently to the notice of Europeans by O'Shaughnessy in the Bengal Dispensatory as a substitute for Copaiba, but has never displaced that drug even in India, although favourable reports of its properties have from time to time appeared in the Medical journals. The natives of the East use it largely as a varnish, and for paying the seams of boats, as it is thought to preserve timber from the ravages of insects. Quite recently it has been brought prominently to notice by Dr. Dougall, of the Andamans, as a remedy for leprosy. According to that gentleman, Garjan Balsam when administered internally and at the same time applied to the skin arrests the disease and promotes cicatrization of the ulcerating surfaces. In order to test the correctness of this statement, large quantities of the Balsam have been distributed by the Indian Government, but as far as I have heard the new treatment is not likely to prove successful. Dr. Dougall's direction for carrying out the treatment of leprosy by Garjan Balsam include frequent ablutions with dry earth and water, and strict attention to the hygienic condition of the patient; it seems probable that he has attributed effects to the Balsam which are in reality due to cleanliness and an improved hygienic condition. Within the last two years several tons of the drug have been distributed in the Bombay Presidency. The method of extracting the Dipterocarpus Balsam was first described by Roxburgh; more recent accounts have been published, but they do not differ in any points of importance from his; shortly, one or more good-sized cavities are cut with an axe in the trunk of the tree about the end of the dry season, a fire is then lighted in them until the wood is scorched; arrangements are next made to catch the Balsam, which exudes very freely. The oil is extracted yearly from the same trees, and according to Roxburgh a good tree will produce 30 to 40 gallons during the season; the surface of the cavity has to be occasionally cut away and re-burnt.

Description.—The freshly-drawn Balsam is an opaque, grey fluid, which when placed in the sun gradually separates into two portions, the upper of which is a thick, viscid fluid of a dark reddish brown colour, and transparent when placed between the eye of the observer and the light, but when viewed by reflected light it is opaque, greenish, and fluorescent. The lower stratum consists of a thick, dirty white magma, and is generally rejected, although it is said to have the same medicinal properties as the clear Balsam. The latter has a feeble copaiba odour, and a bitter aromatic taste; its specific gravity at 16·9° C. is ·964; it is soluble in pure benzol, cumol, chloroform, sulphide of carbon, and essential oils, and partially so in methylic, ethylic, or amylic alcohol, in ether, acetic ether, glacial acetic acid, carbolic acid, or caustic potash dissolved in absolute alcohol; at about 130° C., it becomes gelatinous, and on cooling does not recover its fluidity.

Chemical composition.—The following account by Flückiger and Hanbury is taken from the Pharmacographia:—"Of the Balsam 6·99 grammes dissolved in benzol and kept in a water bath until the residue ceased to lose weight, yielded 3·80 grammes of a dry, transparent, semi-fluid resin, corresponding to 54·44 per cent., and 45·56 of volatile matters expelled by evaporation.

"By submitting larger quantities of the Balsam to the usual process of distillation with water in a large copper still, 37 per cent. of volatile oil were easily obtained. The water passing over at the same time did not redden litmus paper; a dark viscid, liquid resin remained in the still.

The essential oil is of a pale straw colour, and less odorous than most other volatile oils; treated with chloride of calcium and again distilled it begins to boil at 210° C., and passes over at 260, acquiring a somewhat empyreumatic smell and light yellowish tint. The purified oil has a sp. gr. of 0·915 to 0·944, it is but sparingly soluble in absolute alcohol or glacial acetic acid, but mixes readily with amylic alcohol. According to Werner, this oil has the composition $C^{10} H^{22}$, like that of copaiba. He says it deviates the ray of polarised light to the left, but that prepared by one of us deviated strongly to the right, the residual resin dissolved in benzol being wholly inactive. The oil does not form a crystalline compound with dry hydrochloric acid, which colours it of a beautiful blue. DeVry states that the essential oil after this treatment deviates the ray to the right.

The resin contains, like that of copaiba, a small proportion of a crystallizable acid, which may be removed by warming it with ammonia in weak alcohol. That part of the resin which is insoluble even in absolute alcohol, we found to be uncrystallizable. The Gurjunic acid may consequently be prepared by extracting the resin with alcohol (·838) and mixing the solution with ammonia. From the ammoniacal solution Gurjunic acid is precipitated on addition of a mineral acid, and if it is again dissolved in ether and alcohol it may be procured in the form of small crystalline crusts. Gurjunic acid, $C^{44} H^{68} O^{8}$, according to Werner, melts at 220° C., and concretes again at 180° C.; it begins to boil at 260° C., yet at the same time decomposition takes place. By assigning to this acid the formula $C^{44} H^{64} O^{5} + 3 H^{2}O$, which agrees well with Werner's analytical results, we may regard it as a hydrate of abietinic acid, the chemical behaviour of which is perfectly analogous. Gurjunic acid is soluble in alcohol 0·838, but not in weak alcohol; it is dissolved also by ether, benzol, or sulphide of carbon.

In copaiba from Maracaibo, Strauss discovered metacopaivic acid, which is probably identical with Gurjunic; the former however fuses at 206° C. The amorphous resin forming the chief bulk of the residue of distillation of the Balsam has not yet been submitted to exact analysis. We find that after complete dessication it is not soluble in absolute alcohol." Flückiger has since discovered (1878) in Garjan Balsam a crystallizable indifferent resin, Formula $C^{28} H^{46} O^{2}$; it melts at 258·8° F. and dissolves in sulphuric acid with an orange colour.

Commerce.—Garjan Balsam is not an article of commerce in Bombay; small quantities may be sometimes obtained in the native drug shops. The Government supplies have been obtained from the Andaman Islands.

Shorea robusta, *Gärtn.f. Fruct. iii., t.* 186; *Beddome Fl Sylv., t.* 40. The resin.

Vernacular.—Sakoh, Sál (*Hind.*), Sál (*Bomb.*) The resin, Rál, Dhuna (*Hind.* and *Bomb.*)

History, Uses, &c.—The Sál tree, called in Sanskrit Sala and Asvakarna, is very widely distributed throughout India, and is undoubtedly the source of the Rosin or Rál of Hindu and Mahometan writers on Materia Medica. Rál, in Sanskrit Rála, is regarped by the Hindus as attenuant, detergent, and astringent, and is sometimes prescribed internally mixed with sugar, honey or treacle; as with us, it enters into the composition of stimulating plasters and ointments; it is also used for fumigating rooms occupied by the sick. Mahometan writers give a similar account of its properties and uses. The author of the Makhzan-el-Adwiya (*vide* article Kaikahr) notices the fact that more than one kind of Rál is met with, but names the Sakoh or Sál as the source from which the genuine article is obtained. In another part of his work (*vide* article Sakoh) he describes the tree, and says that when old the bark becomes separated from the trunk by the deposit of Rál beneath it. Ainslie mentions three kinds of resin or dammer as common in the bazaars of Southern India, but is in doubt as to the sources from whence the different kinds are obtained. He observes that a great portion of the dammer used in India is imported from Java, Borneo, Joanna, and several of the Soloo Islands. The authors of the Bengal Dispensatory, after conducting a series of experiments with genuine Sál resin, pronounced it to be an efficient substitute for pine resin. In Bombay, at the present time, American rosin is to a great extent displacing Indian Rál. Dr Sakharam Arjun states (Bomb. Drugs) that he has seen Shorea resin mixed with sugar given with good effect in dysentery.

Description.—Rál varies in colour from dark brown to pale amber; it is devoid of taste and smell; sp. gr. 1·097 to 1·123, easily fusible, partially soluble in alcohol (83·1 per 1000), almost entirely in ether, perfectly in oil of turpentine and the fixed oils; sulphuric acid dissolves and gives it a red colour. By dissolving the resin in oil of turpentine and boiling it with a solution of potash until all the turpentine was expelled, O'Shaughnessy obtained a compound of resin and potash entirely soluble in water.

Commerce.—Rál is imported into Bombay from Singapore in casks and bales. Value, Rs 6 per cwt.

Vateria Indica, *Linn., Beddome Fl. Sylv., t.* 84; *Wight Ill. i.* 88, *t.* 36, is the principal source of the white dammer met with in the bazaars of Southern India. Specimens differ much in colour, fragrance and density; some being of a light greenish colour, dense, homogeneous, and vitreous on fracture, whilst others are amber-coloured, and vesicular. These differences apparently arise from the mode of collection; and the age of the trees producing them. It burns with a clear, steady light, giving off a pleasant smell, but very little smoke. With the aid of heat, and the addition of a small portion of Camphor, it is soluble in spirit. Under the influence of gentle heat it combines with wax and oil, and forms an excellent resinous ointment. (Dr. G. Bidie in Pharmacopœia of India.)

Dryobalanops aromatica, *Gärtn. iii.,* 49, *t.* 186; *Hook. Journ. Bot.,* 1852, *t.* 7; *Hayne xii., t.* 17. Borneo Camphor.

Vernacular.—Bhimséni Kápúr or Káfúr (*Hind.* and *Bomb.*)

History, Uses, &c.—Sanskrit writers mention two kinds of Camphor, Pakva and Apakva (cooked and uncooked); it is generally considered that Borneo Camphor is meant by the latter term. In the Rájanirghantu oil of Camphor is mentioned; this may refer to the Borneo Camphor oil, or to some preparation made by dissolving Camphor in oil. Mahometan writers describe the Borneo Camphor as the best kind, and notice the way in which it is obtained by splitting the trunk of the tree. The author of the Makhzan-el-Adwiya gives a full account of it, and mentions the fact of several pieces of the timber having been brought to the Hughli, which when cut up into planks yielded a quantity of Camphor. He also describes the way in which the oil is obtained by incising the tree. Borneo Camphor is supposed by native physicians to have the properties of Camphor in a much higher degree than ordinary Camphor; on this account it fetches an extraordinarily high price. From the researches of Flückiger and Hanbury it appears that this Camphor was the only kind known in Europe in the Middle Ages and was the καφουρὰ of the later Greek writers, who obtained their knowledge of it from the Arabians. Camphor is considered by the Hindus to be hot and dry, and by the Mahometans to be cold and dry, and to stimulate the brain and heart; it is prescribed in a great variety of disorders. The Hindus consider Borneo Camphor to be aphrodisiacal, but the Mahometans hold a contrary opinion; both regard it as a valuable application to the eyelids in inflammatory conditions of the eye. Ainslie mentions the Dryobalanops Camphor as having been recently described by Mr. H. T. Colebroke, who was the first to determine its Botanical genus, but wrongly supposes it to be the chief source of the Camphor used in India. Flückiger and Hanbury in the Pharmacographia (p. 464) give the following account of this Camphor:—" It is obtained from the trunk, in longitudinal fissures of which it is found in a solid crystalline state and extracted by splitting the wood. Trees in a state of decay often contain the finest Camphor. The Camphor when collected is carefully picked over, washed and cleaned, and then separated into three qualities. The produce of a single tree does not, it is supposed, often exceed 11 lbs. A good proportion of the small quantity produced is consumed in the funeral rites of the Batta princes. The Camphor which is exported is eagerly bought for the China market, but some is also sent to Japan, Laos, Cochin China, Cambodia and Siam."

Description and chemical composition.—Borneo Camphor, also termed by chemists Borneol or Camphyl alcohol, is somewhat harder than common Camphor, also a little heavier, so that it sinks in water. It is less volatile, and does not crystallise on the interior of the bottle in which it is kept; and it requires for fusion a higher temperature (198° C). It has a somewhat different odour, resembling that of common Camphor, with the addition of patcholi or ambergris. The composition of Borneol is represented by the formula $C^{10} H^{18} O$. It may be converted by the action of nitric acid into common Camphor, conversely, as Berthelot has shown, Borneol may be prepared from common Camphor by heating the latter with alcoholic potash. The artificial Borneol has the same composition as the natural article, but differs in optical power, and has therefore been termed Camphol (Pharmacographia, p. 465). An alcoholic solution of Borneol examined by Dr. Lyon of Bombay proved to be 12½° dextrogyre. Besides Camphor, the Dryobalanops furnishes a liquid termed Camphor oil, which must not be confounded with the Camphor oil that drains out of crude laurel Camphor. This Bornean or Sumatran Camphor oil is obtained by tapping the trees or in felling them ; it is called Borneene, and is isomeric with oil of turpentine, $C^{10} H^{16}$, yet in the crude state, holding in solution Borneol and resin. By fractional distillation it may be separated into two portions, the one more volatile than the other, but not differing in composition.

Commerce.—The quantity annually shipped from Borneo was reckoned by Motley in 1851 to be about 933 lbs., the export from Sumatra was estimated by De Vriese at 10—15 quintals per annum. The quantity imported into Canton in 1872 was returned as 3,159 lbs., value 42,326 taels, equivalent to about 80*s.* per lb. In the Annual Statement of the Trade of Bombay for the year 1872-73, 2 cwts. of Malayan Camphor is stated to have been imported; it was valued at Rs. 9,141. The price in Borneo in 1851 of Camphor of fine quality was 30 dollars per catty, or about 95*s.* per lb. (Pharmacographia, p. 465.) At the present time, good Borneo Camphor is worth in Bombay Rs. 100 per lb. ; an inferior quality is sold at from Rs. 70—80 per lb. An alcoholic solution of the latter examined by Dr. Lyon was about 2½° lævogyre; on this account he thinks it must be a mixture of Borneo and Ngai Camphor, the product of Blumea

Balsamifera. (For a description of which, confer. Pharmacographia, p. 466.)

MALVACEÆ.

Althæa officinalis, *Linn.*, *Bentl. and Trim.*, *t.* 35. The flowers, carpels, leaves and root.

Vernacular.—The flowers, Gul Khairú (*Hind.* and *Bomb.*) the carpels, Tukm-i-Khitmí (*Pers.* and *Bomb.*); the root, Rishah-i-Khitmí (*Pers.* and *Bomb.*)

History, Uses, &c.—It is the Althæa of Dioscorides,[*] and Theophrastus,[†] and the Anadendromalache of Galen, and was held in great esteem by the Greeks and Latins [‡] on account of its healing properties; following them the Mahometans describe it as a suppurative and emollient; they use the leaves as a poultice and for fomentations; mixed with oil the leaves and flowers are applied to burns and parts bitten by venomous reptiles. The root boiled with sugar is prescribed in coughs and irritable conditions of the intestines and bladder. The decoction is also used as an emollient enema, and in making ointments; in short, with the Mahometans it is as important an article of the Materia Medica as with the French and other Continental nations in Europe.

Description.—The different parts of the plant used in Bombay are imported from Persia. The flowers have by some been attributed to A. rosea, but the carpels which may be found mixed with them have not the membranaceous margin of that plant, and the exterior calyx has from 8—9 divisions instead of 6. The calyx is thick, and covered with simple hairs, very closely set, and arranged in star-like tufts; the flower has five petals, which in the dry article are bluish green at the base, the blades being purple; both calyx and flowers are mucilaginous.

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[*] Dios. iii., 154.

[†] Theophrastus in his 9th Book, says of it, *καί ἥν οἱ μεν ἀλθαίαν, ’εκεῖνοι δε μαλάχην ἀγρίαν καλουσι.*

[‡] Pliny 20, 21; also as Hibiscum, ib. 20, 4.

The root appears to be the same as the European article, but it is not decorticated, nor is it so plump and free from fibre. The carpels are large and pubescent, and are known as Tukm-í-khitmí.

Microscopic structure.—The cortex of the root is chiefly liber; the parenchyme consists partly of starch and partly of mucilage cells; stellate raphides may be seen. The central portion is composed of wood cells, scalariform and pitted vessels, and parenchymatous tissue.

Chemical composition.—According to Flückiger and Hanbury, the mucilage in the dry root amounts to about 25 °/ₒ and the starch to as much more. The former appears to agree with the formula $C^{12} H^{20} O^{10}$, thus differing from the mucilage of Gum Arabic by one molecule less of water. It likewise differs in being precipitable by neutral acetate of lead; at the same time it does not show the behaviour of cellulose, as it does not turn blue by iodine when moistened with sulphuric acid, and it is not soluble in ammoniacal solution of oxide of copper. The root also contains pectin and sugar, and a trace of fatty oil. Tannin is found in very small quantity in the outer bark alone. Marshmallow root contains from 0·8 to 2·0 °/ₒ of asparagin, which is a widely diffused constituent of plants; it crystallises in large prisms or octohedra of the rhombic system, and is tasteless and apparently destitute of physiological action. The peeled root dried at 100° C. and incinerated affords 4·88 of ash, rich in phosphates. (Pharmacographia, p. 85.)

Commerce.—The flowers, carpels, and root are imported from Persia. Value, flowers, 2 *as.* per lb.; seeds, 4 *as.*; root, 4 *as.*

In connection with this drug may be mentioned the Althée of the Portuguese at Goa, a substitute for Althæa; it is produced by a stunted woody shrub, probably a species of Hibiscus, with cordate, serrated leaves, the flowers and fruit of which I have not seen. The drug consists of several roots branching from a knotted woody stock, the largest being about as thick as the little finger. They are straight, unbranched, and have a thin brown cortex covering a thick white farinaceous parenchyma, in which are seen well marked yellowish medullary rays, spreading from a tough, woody, central column, the diameter of which is less than the semi-diameter of the farinaceous portion; examined under the microscope most of the cells of the parenchyme are seen to be filled with starch granules; but some large ones contain mucilage only. The central woody column abounds in large pitted vessels. Soaked in water the root gives out abundance of mucilage having a faintly bitter taste. When properly scraped and dried it is very white and apparently an efficient substitute for the imported article. The roots of Hibiscus rosa sinensis, the Jásund of Bombay, are also dried and sold in the shops as a substitute for Althæa. In the Concan the fresh root-juice of the white-flowered variety is given in doses of two tolás with milk, sugar and cummin for gonorrhœa, and the root powdered is given with an equal quantity of Lotus-root and the bark of Eriodendron anfractuosum in the same manner for menorrhagia, the dose of the three being 6 massas.

Malva sylvestris, *Linn.*, *Eng. Bot.* 671. The fruit.

Vernacular.—Khubazí (*Arab.* and *Bomb.*)

History, Uses, &c.—This plant is the Malakhí of Dioscorides,* and was used by both Greeks and Romans as a medicine on account of its mucilaginous and cooling properties. It is the Nán-i-kulágh and Khitmí-i-kuchak of the Persians. The Mahometans probably derived their knowledge of its medicinal properties from the Greeks. Maulána Nafís describes three kinds, viz.:—

1*st*, A cultivated kind called Malokia.

2*nd*, A large wild kind called Khitmí.

3*rd*, A small wild kind called Khubazí.

The author of the Makhzan-el-Adwiya pronounces the last mentioned to be the article now known as Khubazí, and describes it thus:—"Leaves roundish, tasteless, a little hairy on the under surface; flower small, reddish purple; fruit round and flat, depressed in the centre, colour white or brown. The plant is much smaller than Khitmí." All parts of the plant are commended in Mahometan works on account of their mucilaginous and cooling properties, but the fruit is considered to be most efficient.

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* Dios., ii., 109, who says that Zoroaster called it Diadesma and the Egyptians Khokorteen. It is the Malva of Latin writers, who notice two kinds. Plin. 20, 21. Prosper Alpinus describes and figures Corchorus olitorius as Melochia.

Description.—The fruit consists of from 10—12 glabrous wrinkled carpels, each containing one reniform seed; some of it is mature, but at least half is in various stages of immaturity, a portion of the thin papery calyx is attached to the fruit, and in a good fresh sample a few deep blue flowers may be found as well as the peduncles and portions of the leaf. Some seed planted in Bombay in June grew freely, and produced strong flowering plants in the rainy season.

Chemical composition.—Water dissolves the mucilage and a little bitter extractive.

Commerce.—The fruit is imported from Persia under the name of Khubazí. It is worth Re. ¼ per. lb.

Sida carpinifolia, *Linn., Wight Ic., t.* 95.
,, **rhombifolia,** *Linn., Cav. Diss. I., t.* 3, *f.* 12.
,, **cordifolia,** *Linn., Dil. El.* 171, *f.* 209.
,, **spinosa,** *Linn., Cav. Diss. I., t.* 1, *f.* 9.

The roots.

Vernacular.—S. carpinifolia, rhombifolia, and cordifolia, Bariára (*Hind.*), Bala, Janglí-methí, Tupkaria, Tukati, Chikana, Páta (*Bomb.* and *Goa*), Malai-tangí, Mayir-manikham (*Tam.*); S. spinosa, Gulsakarí (*Hind.*)

History, Uses, &c.—The plants belonging to this genus are known in Sanskrit by the general name Balá. Four kinds are mentioned in medical works, namely, Batyálaka (S. cordifolia), Mahábalá (2. var of S. rhombifolia), Nágabalá (S. spinosa). The Hindus regard the roots of the different species of Sida as cooling, astringent and tonic; they prescribe them in nervous and urinary diseases, and in fever. The root bark is beaten up with milk and sugar, and aromatics and stimulants are sometimes added. (For original prescriptions, see Dutt's "Hindu Materia Medica," p. 121.) In the Concan the leaves of S. cordifolia (Chikana) with other cooling leaves are applied in ophthalmia; the root-juice is used to promote the healing of wounds, and the juice of the whole plant pounded with a little water is given in ¼ seer doses for spermatorrhœa. The root of S. carpinifolia (Tupkaria) is applied with sparrow's dung to burst boils. The Mahometans consider Balá to be aphrodisiac. Ainslie notices several species of Sida, and the uses to which they are applied by the Hindus. The authors of the Bengal Dispensatory, after a trial of the roots of Sida carpinifolia, were unable to satisfy themselves as to its febrifuge action, but it was found to promote perspiration, to increase the appetite, and to act as a useful bitter tonic. In Goa the Portuguese value it as a diuretic, especially in rheumatic affections; they also use it as a demulcent in gonorrhœa.

Description.—The roots of the different species of Sida are about ¼ of an inch in diameter at the stock, woody, and fibrous. The bark is of a light yellowish brown colour; unless the leaves are attached they cannot be distinguished with any certainty. In Western India, S. carpinifolia and S. cordifolia are most used. The first has smooth lanceolate, serrated leaves; the second cordate, tomentose leaves.

Chemical composition.—The root of S. carpinifolia strikes a blue colour with salts of iron, does not precipitate gelatine, yields to boiling water 23 parts, to alcohol 19 parts per cent.; it contains asparagin.

Commerce.—None of the roots are articles of commerce in Bombay.

Abutilon indicum, *G. Don., Wight Ic., t.* 12. The bark, leaves, and seeds.

Vernacular.—Kanghí (*Hind.*), Petàrí, Madmí, var tomentosum, Chakra-bhenda (*Bomb.*), Tubocuty (*Goa*), Tutti (*Tam.*) The seeds, Balbíj (*Bomb.*)

History, Uses, &c.—There are several varieties of this plant, the most remarkable being a tomentose, hoary variety, which produces the Balbij of the Bombay shops, and another with purple stems called Kálí kanghí in Hindustani and Koran-tuttí in Tamil. The leaves, bark and seeds would seem to have been long in use among the Hindus on account of their mucilaginous and diuretic properties. Under the names of Masht-el-ghoul and Deishár, short notices of the plant may be found in Arabic and Persian books. Ainslie's *Sida Mauritiana* is evidently identical with it. In this part of India at the present time the bark is valued as a diuretic and the seeds on account of their demulcent and mucilaginous properties. A. Indicum is very common on waste ground, and appears to flourish in poor soil, and require but little water. Ibn Sína mentions a drug called Abútílún ابوطيلون which was applied to wounds, but as he likens it to a Pumpkin it must have been quite different from the plants now known as Abutilon.

Description.—The bark occurs in long, thin, tough, fibrous strips, which are very strong; externally it is striated and covered by a cinnamon-coloured epidermis, internally it is white and striated; the striæ are produced by small interspaces between the fibrous bundles of which the bark is chiefly composed. The taste is feebly astringent and bitter. The seeds of the tomentose variety are reniform, about 1-10th of an inch long, and nearly as broad at the larger end, three in each carpel; testa very hard, dull brown, covered with simple hairs, rising from a conical base, which is attached to the testa by radiating processes like roots. The following is a description of the plant obtained by sowing the Balbij of the shops:—Shrubby, hoary, covered all over with a dense silky tomentum of simple hairs; leaves cordate, unequally and sharply serrated; calyx 5 cleft; pedicels axillary, jointed near the flowers, which are of an orange colour, and open in the evening; capsules truncated, longer than the calyx; carpels about twenty, not awned, hairy on the dorsum.

Commerce.—The seed is sold by all druggists. It comes chiefly from Guzerat and Kattiawar. Value, Rs. 6 per Surat maund of 37½ lbs.

Hibiscus Abelmoschus, *Linn., Wight Ic., t.* 399. The seeds.

Vernacular.—The seeds, Mishk-dánah, Mushk-bhendí-ke-bij (*Bomb.* and *Hind.*), Kattuk-kasturí (*Tam.*), Kasturí-bhenda (*Mar.*)

History, Uses, &c.—These aromatic seeds are called in Sanskrit Latakasturika. The Hindus regard them as cooling, tonic and carminative. Arabic and Persian writers notice them under the name of Mishk-dánah, and describe them as Indian, and especially abundant in Bengal; they consider them to be cold and dry, and to have stomachic and tonic properties. The author of the Makhzan-el-Adwiya recommends a mucilage prepared from the root and leaves of the plant in gonorrhœa. The seeds are noticed by Ainslie, who states that in Arabia they are mixed with coffee. He suggests their use as a perfume. In Bombay the plant may be seen in gardens, and the seeds are tied up with woollen clothes to preserve them from moth; they are also rubbed to a paste with milk and used to cure itch. Abelmoschus is a corruption of the Arabic name, Habel-mishk.

Description.—The seeds are brown, about 2 lines long, kidney-shaped, slightly compressed, marked with minute parallel elevated lines; they have a small distinct hilum; the odour is purely musky, and not very perceptible unless the seeds are rubbed.

Chemical composition.—M. Bonastre, who analysed the seeds, found them to consist of parenchyme and moisture 52, gum 36, alumen 5·6, and fixed oil, solid crystalline matter, odorous principle and resin 6·4. The fixed oil was greenish yellow, fluid at 32° Fahr., but solidified gradually by exposure to the air. The solid crystalline matter was deposited from the hot alcoholic solution of the seeds; it was white, pearly, of a pleasant taste, soluble in ether, from which it crystallized in rays, fusible at 95° Fahr. The odorous matter was a light green fluid, with a strong smell of musk; it was not volatile.—(*Journal de Pharmacie,* Vol. xx., p. 381.)

Commerce.—The seeds are not an article of commerce in Bombay.

Hibiscus esculentus, *Linn., Bentl. and Trim., t.* 36. The fruit.

Vernacular.—Rám-turai (*Hind.*), Bhenda (*Bomb.*), Vendaikkay (*Tam.*)

History, Uses, &c.—It is doubtful whether this plant is a native of India. Dr. Hooker seems inclined to think that it is. It has a Sanskrit name Tindisa. The Arabs and Persians call it Bámiya; according to Ibn Baitar, Abul-Abbas describes its cultivation and use in Egypt as a vegetable. The author of the Makhzan-el-Adwiya states that it is called in Bengal Vilayatí Palwal, and in Hindustani Bhendí, and that it is in India considered to be aphrodisiac. The modern Bengali name is Dhéras. Palwal is the Trichosanthes dioica, the fruit of which is of a somewhat similar shape to that of H. esculentus. In like manner a similarity of shape with the fruit of Luffa acutangula (Turai) has given rise to the Hindustani name Rámturai. The Indian nomenclature is thus favourable to the opinion that the plant is an introduced one. Mahometan writers describe it as cold and moist and beneficial to people of a hot temperament. Roxburgh considers it to be nourishing as well as mucilaginous, and recommends it as a valuable soothing and demulcent remedy in irritation of the throat caused by coughing. In the Bengal Dispensatory a lozenge is recommended. Finally, in the Pharmacopœia of India, the immature capsules have been made official for the preparation of the decoction, which is intended to be used as an emollient, demulcent and diuretic in catarrhal affections, ardor urinæ, dysuria, and gonorrhœa.

Description.—The fresh immature capsules are from 4—12 inches in length, about an inch in diameter at the base, tapering, furrowed, somewhat bristly, particularly at the ridges, which correspond in number with that of the cells and valves, *viz.*, from 5—8, with a single row of smooth round seeds in each cell, abounding in a copious, bland, viscid mucilage, which exists more or less in all parts of the plant.

Microscopic structure.—The hairs of the fruit are peculiar, the base consisting of one large cell, to which a number of small cells are attached; in the middle and outer zone of the pericarp are large cavities filled with mucilage.

Chemical composition.—Popp has examined the fresh capsules. He states that they abound in pectin, starch and mucilage. When dried they afforded from 2—2·4 °/。 of nitrogen, and an ash rich in salts of lime, potash, and magnesia. The ripe seeds gave 2·4—2·5 °/。 of nitrogen; their ash 24 °/。 of phosphoric acid.—"Archiv der Pharmacie," CXCV. (1871, 142.)

Commerce.—No part of the plant is an article of commerce.

Hibiscus subdariffa, *Linn., Cav. Diss. vi., t.* 198, *f.* 1. Roselle.

Vernacular.—Patwa (*Hind.* and *Sind*), Lál-ambárí (*Bomb.*)

Description.—This plant is cultivated in several parts of India. The fleshy red calyx is used as a fruit, and when dried as an acid article of diet like tamarind. In bilious conditions a diet drink is made by boiling it with water and adding a little salt, pepper assafœtida and molasses. The seeds are an excellent food for cattle, and the stems yield tow. The cultivation is attended with very little expense, the seed being sown at the commencement of the rainy reason and the crop ripening at its close.

Chemical composition.—The dried calices yielded to analysis —Water 8·29, watery extract 65·96, cellulose 7·68, insoluble ash 3·88, soluble ash 2·44, alkalinity of soluble ash as potash ·75, tartaric acid 9·90, remaining free acid as malic acid 15·54—total free acid per 100 parts dry substance 27·44. (Lyon, 1882.)

Hibiscus cannabinus, *Linn., Roxb. Cor. Pl. i., t.* 190.

Vernacular—Ambárí, is extensively cultivated for its fibre, and the leaves are used as a potherb. One tola of the juice of the flowers, with sugar and black pepper, is a popular remedy for biliousness with acidity.

Thespesia populnea, *Corr.*, *Wight Ic.*, *t.* 8; *Bedd. Fl. Syl.*, *t.* 63. The bark and fruit.

Vernacular.—Páras-pipal (*Hind.*), Bhendí (*Bomb.*), Purashamaram (*Tam.*)

History, Uses, &c.—This tree abounds on the Western Coast, and is well known to Europeans as the Bhendí tree; it is much valued on account of the toughness of its timber, which is used for carriage building. The fruit abounds in a viscid yellow juice of the colour of gamboge, which the natives use as an external application in psoriasis. The tree is called in Sanskrit Párisa; it is noticed by Ainslie, who says that a decoction of the bark is given internally as an alterative to the extent of 3—4 ounces twice daily. The authors of the Bengal Dispensatory also notice it, but express no opinion as to its properties. Several trials with this remedy were made by the Editor of the Pharmacopœia of India in scabies and other cutaneous diseases; in some cases it exercised a favourable influence, but in the majority it was productive of little or no benefit. In Bombay the natives may often be seen gathering the fruit; it is therefore to be supposed that they derive some advantage from its use.

Description.—The capsule is about 1¼ inch in diameter, oblong, depressed, scaly, ultimately glabrescent, coriaceous, 4-celled, each cell being divided by a partial dissepiment into two parts; seeds the size of a pea, pilose, cotyledons conduplicate, radicle thick, the capsule abounds in viscid yellow juice, which is contained in lacunæ in the inner soft portion. This juice when mixed with water forms a primrose coloured emulsion, which is not precipitated by oxalate of ammonia, sulphuric acid, chloride of barium, or subacetate of lead. On the addition of Liq. Potassæ and alcohol 60° O. P., the emulsion becomes transparent and retains its yellow colour; on the addition of sulphuric acid to the clear potash solution, the colouring matter separates as a curdy precipitate of a greenish yellow colour which floats upon the surface.

Bombax malabaricum, *D. C., Wight Ill., t.* 29; *Bedd. Fl. Syl., t.* 82. The gum and roots.

Vernacular.—Simul, Rakta Simul (*Hind.* and *Beng.*), Saur (*Bomb.*), Mul-ilava-maram (*Tam.*)

The gum, Mocharas, Suparí-ka-phúl (*Hind.* and *Bomb.*)

History, Uses, &c.—The B. malabaricum, Sanskrit Sálmali and Mocha, is a large tree, covered with stout, hard, conical prickles; in the cold weather it is a very remarkable object, being entirely destitute of leaves, and loaded with large red cup-shaped flowers, which are followed by egg-shaped green capsules containing numerous black seeds and a quantity of fine silky cotton. Mahometan writers state that the young roots have restorative, astringent and alterative properties; powdered they form the chief ingredient in the *músla-semul,* a medicine which has a reputation as an aphrodisiac (in the Concan the roots of Eriodendron anfractuosum are preferred. They are dried in the shade, powdered and mixed with the juice of the fresh bark and sugar. This tree is called Pándhra Saur in Marathi and Dolo Shamlo in Guzerathi). The gum is very astringent, and is used by both Hindus and Mahometans in diarrhœa, dysentery, and menorrhagia in doses of from 40—50 grains for an adult. Mocharas, the juice of Mocha, only exudes from portions of the bark which have been injured by decay or insects; incisions in the healthy bark produce nothing.

Description.—When first exuded it is a whitish fungous mass, which gradually turns red, and finally dries into brittle mahogany-coloured tears. The larger tears are hollow in the centre, the cavity being produced during the gradual drying of the jelly-like mass which first exudes. Dry Mocharas when soaked in water swells up, and resumes very much the appearance of the fresh exudation. The taste is purely astringent, like tannin.

Microscopic structure.—Mocharas is not a simple juice, but the product of a diseased action, which consists in a proliferation of the parenchyme cells of the bark; upon making a section of the diseased part, a number of small cavities are seen, which contain a semi-transparent jelly-like substance, consisting of oblong cells with botryoidal nuclei. At the margin of the cavity the columns of healthy cells are seen breaking up, and the cells separating to join the jelly-like mass; this gradually increases in size and finds its way to the surface to be extruded as Mocharas. Upon its first appearance it is of an opaque, yellowish white colour, firm externally, but semi-fluid internally, and there is no central cavity. The cause of the diseased condition of the bark which produces Mocharas has not been determined.

Commerce.—Mocharas is collected by Bheels and wandering tribes in Western India. It is sold by all the druggists. Value, Rs. 4 per Surat maund of 37½ lbs. The gum of Moringa (shégva) is frequently mixed with Mocharas; though similar in colour, it may readily be distinguished by its weight and solidity.

Adansonia digitata, *Linn.*, *Cav. Diss. v.*, 298, *t.* 15. The fruit, bark and leaves.

Vernacular.—Gorakh amlí (*Hind.*), Gorakh chintz, Churí chintz (*Bomb.*)

History, Uses, &c.—This African tree, remarkable for the enormous size of its trunk, was introduced into India by the Arabians, who call it Bahobab, Habhab or Habhabú. At Sennar it is called El Omarah and Oufa, and the fruit El Kongles. Prosper Alpinus figures it, and notices that the powdered pulp was sold as terra Lemnia to those unacquainted with the genuine article; it was eaten with sugar as a cooling medicine in febrile disorders. The Indian names, Gorakh amli and Gorakh chintz, signify Gorakh's tamarind. Gorakh was a celebrated Hindu ascetic, who probably taught his disciples under this tree. A. digitata is common on the Coast near Bombay; the fruit makes floats for fishing nets and bottles for holding water; it contains a quantity of mucilaginous pulp, having a pleasant, cool, sub-acid taste, like cream of tartar, which it retains when dry. In Africa it is used in dysentery, and the leaves are made into poultices and used as a fomentation to painful swellings, &c. The leaves dried and reduced to powder are called Lalo by the Africans, and are used to check excessive perspiration. (Royle.) Duchassaing recommends the bark as an antiperiodic in fever. In Bombay the pulp mixed with buttermilk is used as an astringent in diarrhœa and dysentery. In the Concan the pulp with figs is given in asthma, and a sherbet made of it with the addition of cummin and sugar is administered in bilious dyspepsia. It is also given for this affection with Emblic myrobalans, fresh mint, rock salt and long pepper.

Description and Microscopic structure.—The fruit varies much both in shape and size; some specimens correspond to the description given by Adanson, and others to that of Guibourt, that is to say, they are either cucumber-shaped or bottle-shaped and from 9—18 inches in length. The shell is hard, woody and light, clothed with a dull green felt like down, composed of simple hairs; it is made up of regularly arranged wood cells intersected here and there by vascular bundles. The fruit is full of sub-acid pulp, which is divided by fibrous bands into a number of compartments. The pulp dries up into a starch-like powder, which adheres together in polyhedral masses, a seed forming the centre of each; it consists of mucilage cells and contains no starch. The seeds are enclosed in a horny shell, with a rusty red, rough exterior; they are kidney-shaped, and half an inch in length. The structure of the bark is very confused; it looks like a tissue of pitted and wood cells, without any regular arrangement; the epidermis is scabrous, a section shows a mottled yellowish green and reddish brown surface; internally it is intimately united with the woody fibre of the trunk; it does not taste bitter, but contains a bitter alkaloid (Adansonin), soluble in alcohol and forming needle-like crystals with acids. The fruit is kept in most druggists' shops for the sake of the pulp, the only part used medicinally in Bombay. It contains pectin and several organic acids.

Chemical composition.—*Adansonin* is extracted from the bark by ether, from which it crystallises on evaporation. (Walz.)

Wittstein boils the alcoholic extract of the bark with water, shakes the decoction with oxide of lead, evaporates the filtrate, and treats the residue with ether, which takes up the Adansonin. Adansonin forms white needles and prisms, melting to a resin below 100° C.; it is non-nitrogenous. Form. $C^{48} H^{36} O^{33}$. (Walz.) It is insoluble, or only very slightly soluble in water; it dissolves in ammonia, forming a yellow solution, from which it is precipitated by acids, and is easily soluble in aqueous and absolute alcohol, and in ether.

The red *colouring matter of Adansonia* may be extracted by alcohol from the bark, which has been previously exhausted with ether; it forms a dark blood-red mass, containing 59·21 p. c. C., 6·08 H., and 34·71 O. It is soluble in 200 parts boiling water, which throws it down in the form of a red powder on cooling. (Gmelin, 18, 213.)

Pavonia odorata, *Willd.* The root.

Vernacular.—Sugandha-bala (*Hind.*), Kálá-vállá (*Bomb.*), Perámútiver (*Tam.*)

History, Uses, &c.—A glandular pubescent, herbaceous plant, with cordate-ovate slightly lobated leaves and pink flowers. The roots, which are smooth, brown, and when dry about as thick as a quill, have a delicate aromatic perfume. They are used in Hindu Medicine, and described as cold and stomachic. Ainslie notices the drug. (Mat. Ind. ii., 297.) The Sanskrit names are Bálá and Hrivera. In Bombay Serpentary root imported from Europe is universally substituted for this drug.

Gossypium herbaceum, *Linn., Wight Ic., t.* 9, 11; *Royle Ill., t.* 23.

Vernacular.—Kapás (*Hind.* and *Bomb.*), Paruthi (*Tam.*)

History, Uses, &c.—Cotton, the Karpási of Sanskrit writers, was doubtless first known and made use of by the Hindus;

it is the *βύσσος* of the later Greek writers, such as Philostratus[*] and Pausanias,[†] but not of the earlier Greeks, who applied the term to a fine kind of flax used for making mummy cloths. Pliny calls it Gossympinus, Gossypion; and Xylinum.[‡] In Arabic cotton is called قطن and قرفس (Kuttun and Kurfus), the latter term being evidently derived from the Sanskrit. Eastern physicians consider all parts of the cotton plant to be hot and moist; a syrup of the flowers is prescribed in hypochondriasis on account of its stimulating and exhilarant effect; a poultice of them is applied to burns and scalds. Cotton cloth or mixed fabrics of cotton with wool or silk are recommended as the most healthy for wear. Burnt cotton is applied to sores and wounds to promote healthy granulation; dropsical or paralysed limbs are wrapped in cotton after the application of a ginger or zedoary *lép* (plaster); pounded cotton seed, mixed with ginger and water, is applied in orchitis. Cotton is also used as a moxa, and the seeds as a laxative, expectorant and aphrodisiac. The juice of the leaves is considered a good remedy in dysentery, and the leaves with oil are applied as a plaster to gouty joints; a hip bath of the young leaves and roots is recommended in uterine colic. In the Concan the root of the Deokapás rubbed to a paste with the juice of Patchouli leaves has a reputation as a promoter of granulation in wounds, and the juice of the leaves made into a paste with the seeds of Vernonia anthelmintica is applied to eruptions of the skin following fever.

Cotton root bark is official in the United States Pharmacopœia, also a fluid extract of the bark; it appears to have first attracted attention from being used by the female negroes to produce abortion. There appears to be little doubt that it acts like ergot upon the uterus, and is useful in dysmenorrhœa and suppression of the menses when produced by cold; a decoction of 4 ounces of the bark in two pints of water boiled down to one pint may be used in doses of two ounces every 20 or 30 minutes, or the fluid extract may be prescribed in doses of from 30 to 60 minims. Cotton seed tea is given in dysentery in America; the seeds are also reputed to be galactagogue. (Stillé and Maisch., Nat. Disp., p. 678.) By alternately treating cotton with a dilute alkali and a dilute acid, it loses its greasiness and becomes absorbent and a valuable dressing for wounds; this absorbent cotton may be medicated by sprinkling it with solutions of carbolic acid, salicylic acid, boracic acid, &c. Pyroxylin or Gun Cotton is made by dipping cotton into a mixture of equal parts of nitric and sulphuric acids, washing freely with water, and drying.

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[*] Philostr. 71

[†] Paus. 6, 26.

[‡] Plin. 12, 10; 19, 1 et 2.

Description.—Cotton root bark is in bands or quilled pieces, one half a line thick, covered with a brownish-yellow, satiny, very thin cork, by the abrasion of which irregular, dull, brownish orange patches appear. The cork forms slight longitudinal ridges, which are often confluent into elongated meshes, and marked with black circular dots or short transverse lines. The inner surface is whitish or reddish white, of a nearly silky lustre, and finely striate in a longitudinal direction by the thin medullary rays. The bast fibres are long and tough, arranged in tangential rows, and are separated without difficulty in very thin layers. The bark breaks with difficulty in a transverse direction, but is readily torn longitudinally. It is without odour, and without taste, with the exception of a very slight acridity and faint astringency. (Stillé and Maisch.)

Chemical composition.—The bark contains *starch*, and when fresh, according to W. A. Taylor (1876), a *chromogen*, which dissolves in alcohol with a pale yellow colour, gradually changing to a bright brownish-red. The same change takes place on keeping the bark for some time, when it yields a red tincture with alcohol. This substance was examined by Prof. Wayne (1872) and W. C. Staehle (1878), who regard it as of a resinous nature. The latter obtained about 8 per cent. of this substance, which is soluble in 14 parts of alcohol, 15 of chloroform, 23 of ether, and 122 of benzole; also in alkalies, from which solutions it is again precipitated by acids. The potassa solution diluted with water is of a sage green tint. Glucose was likewise observed, and the aqueous solution of the alcoholic extract contained a principle which gave a purplish-black precipitate with ferric chloride. C. C. Drueding (1877) obtained also a yellow resin soluble in petroleum-benzine, a fixed oil, a little tannin and 6 per cent. of ash. Cotton seeds yield a dark reddish-brown fixed oil, containing much albuminous matter; it can be bleached by treatment with alkalies and with sulphuric acid, and finally be obtained of a light straw colour, and bland taste. One bushel of seeds shelled will yield about two gallons of crude oil. It is not suitable for pharmaceutical purposes. (Stillé and Maisch.)

Commerce.—Cotton root bark is not an article of commerce in India; it may be obtained fresh in most parts of the country.

STERCULIACEÆ.

Sterculia urens, *Roxb., Cor. Pl. I.* 25, *t.* 24. The gum.

Vernacular.—Buli, Kúlú (*Hind.*), Karái, Pándrúk, Kándol (*Bomb.*).

History, Uses, &c.—The tree is well described in the Bengal Dispensatory. The trunk is erect, very straight, top large and shady; bark light ash-coloured, very smooth, outer coat thin, transparent, covered with a farinaceous substance, inwardly fibrous and netted; leaves about the extremities of the branches, alternate, petioled, 5-lobed, 5-nerved, lobes acute, very downy, from 9—12 inches each way. Petioles nearly as long as the leaves, round, downy, panicles terminal, pretty large, covered with a glutinous, farinaceous yellow down; bracts lanceolate; flowers small, numerous, yellow, male and hermaphrodite mixed; calyx campanulate, 5-toothed, leathery, divisions acute, with an obcordate hairy gland on the inside of each division next the base; corolla none; filaments ten, alternately longer, united below into a thin sheath; anthers 2-lobed, alternately larger; ovary 5-lobed; style single, short, thick; stigma 5-lobed; follicles covered with yellow down and many stiff stinging hairs. S. urens is abundant in Khandeish and the

Concan, where the gum is collected for sale; it enters commerce as Karai-gond, and is largely used in making native sweetmeats, and as a substitute for Tragacanth.

Description.—The gum exudes most abundantly in the hot weather; it varies a good deal in appearance, some pieces being in thin laminæ, like Tragacanth, while others are lumpy or vermiform. Placed in water it forms a firm, colourless, tasteless jelly which, when much diluted, becomes diffused; by protracted boiling it is dissolved; the solution is partially precipitated by acetate of lead.

Commerce.—Khandeish supplies the largest quantity to the Bombay market. Value, Rs. 4 per Surat maund of 37½ lbs.

Helicteres Isora, *Linn.*, *Wight. Ic.*, *t.* 180; *Rheede, Hort. Mal. VI.*, *t.* 30. The fruit.

Vernacular.—Marorí, Marorphalí (*Hind.*), Murádsingh, Kawun, (*Bomb.*), Valumbirikai (*Tam.*)

History, Uses, &c.—This is a tall shrub, or small tree, much resembling the common hazel; the flowers, which are bright red and showy, appear in the rains. In Sanskrit it is called Avartani. The peculiar twisted form of the carpels has probably led to its use as a medicine according to the ancient doctrine of signatures. Ainslie notices its use by the Hindus as a remedy for offensive sores inside the ears. At the present time it enters into most prescriptions for the cure of griping in the bowels and flatulence, especially in the case of children. Its chief virtue seems to be its harmlessness. It is indispensable at the marriage ceremonies of the Vaisya caste, being tied upon the wrist of bride and bridegroom along with the fruit of Randia dumetorum. Persian names for it are Kisht-bar-kisht and Pechak. It is the Kisht-bar-kisht of Ibn Sína, who describes it as hot and dry in the third degree.

Description.—The fruit consists of five slender angular carpels, twisted like a corkscrew, and together forming a cone about 1½—2 inches long. The carpels are pubescent, and of a greenish brown colour; they contain a single row of dark brown angular seeds. The internal surface is of a light greenish hue; and highly polished; taste mucilaginous. Medicinally I consider this drug to be simply demulcent.

Commerce.—It is kept in all druggists' shops, and as a domestic remedy is perhaps one of the best known articles in the Hindu Materia Medica. Value, Rs. 3½ per Surat maund of 37½ lbs.

Pterospermum suberifolium, *Lam., Ill., t.* 576, *f. ii.* The white fragrant flower of this tree, which appears in May, rubbed into a paste with Kángika (rice vinegar), is an ancient and well-known Hindu remedy for hemicrania. The Sanskrit name of the plant is Muchukunda, which is also the current name in Bombay for P. suberifolium and P. acerifolium. In the Concan the flowers and bark of these trees are charred and mixed with Kamala and applied in suppurating small-pox.

Abroma augusta, *Linn., Lam. Ill., t.* 636 *and* 637.

Vernacular.—Olaktambol (*Bomb.*), Ulatkambal (*Beng.*)

History, Uses, &c.—This shrub, very common in Bengal, and to be seen in gardens in Bombay has soft velvetty branches, ovate-oblong leaves, and rather handsome dark red flowers; the fruit is 5-angled, containing the seeds in a light cottony envelope. The root bark has been brought to notice as an emmenagogue by Mr. B. M. Sircar in the *Indian Medical Gazette* (1872); it has also been noticed by Dr. S. Arjun in his "List of Bombay Drugs." Dr. J. H. Thornton considers that it is useful in the congestive and neuralgic varieties of dysmenorrhea, and that it regulates the menstrual flow and acts as a uterine tonic. It should be given during menstruation, with black pepper, the latter acting as a stomachic and carminative. The dose is said to be half a drachm of the fresh viscid juice of the root-bark (Am. Journ. Med. Sc.,

p. 276, 1873.) Dr. Watt, in his Dictionary of the Economic Products of India, has collected the testimony of eight medical men in favour of the emmenagogue properties of this plant.

TILIACEÆ.

Corchorus trilocularis, *Linn.*, *Jacq. Vind.* 2, *t.* 173. The seeds.

Vernacular.—Kurrú Chuntz (*Bomb.*) The seeds, Rája-jíra (*Bomb.*)

History, Uses, &c.—The C. trilocularis is a small annual plant which appears in the rainy season along with C. olitorius, from which it may be distinguished by its oblong, lanceolate leaves, trilocular capsules, and small seeds. Ainslie mentions the latter plant as being used medicinally by the Hindus, and says that they reduce it to ashes and mix it with honey for administration in obstructions of the abdominal viscera. He also notices its use as a pot-herb. According to Twining, an infusion of the leaves forms a useful fever drink. In Bombay the seeds of C. trilocularis, which are bitter, are administered in doses of about 80 grains in fever and obstructions of the abdominal viscera. A bitter corchorus was known to the Greeks. Theophrastus says *ὁ παροιμιαζόμενος διὰ τὴν πικρότητα κόρχορος.* (H. P., 77.) Pliny (21, 32 and 25, 13) also mentions it as a poor kind of pulse growing wild.

Description.—The seeds, which are closely packed in the trilocular capsule, are small, black and angular; they are generally more or less mixed with those of C. olitorious, which may easily be distinguished by their greater size ($\frac{1}{10}$th of an inch) and peculiar shape, which resembles that of a mooring buoy.

Corchorus fascicularis, *Lam.*, a small procumbent woody plant with oblong or lanceolate serrated leaves; peduncles 2—5 flowered, opposite to the leaves; capsules linear oblong, nearly terete, rostrate, three-celled, about half an inch long, clothed with simple hairs; they contain a number of small dark brown angular seeds. The whole plant is sold in the shops; it is very mucilaginous and somewhat astringent, and is valued as a restorative. Hirankhorí is the name given to it by the country people, and means deer's hoof. In the Bombay shops it is called Bhauphalí, which name must not be confounded with Bhaphalí, the Maratha name for an umbelliferous plant.

Grewia tilicæfolia, *Vahl. Beddome Fl. Syl., t.* 108.

Vernacular.—Dhámaní (*Hind., Beng.*), Dháman (*Bomb.*)

History, Uses, &c.—A tree, leaves hoary beneath, oblique cordate, dentate, 5-nerved, feather veined, petioles 1 inch, pubescent, thickened at the top, stipules leafy, falcate acuminate, auricled on one side. Bark thick, white internally, covered externally by a thin grey suber which readily peels off, showing a slightly rough, green surface beneath, very mucilaginous and sweetish to the taste. In the Concan the bark, after removal of the suber, is rubbed down with water and the thick mucilage strained from it and given in 5 tolá doses with 2 tolás of the flour of Panicum miliaceum (Warrí), as a remedy for dysentery. The Sanskrit name of the tree is Dharmana.

Grewia pilosa, *Lam.*, with scabrous leaves, stem and fruit.

Vernacular.—Khatkhati (*Mar.*), is given in accordance with the doctrine of signatures as a remedy for leprosy in the Concan; it appears to be simply mucilaginous like most of the genus.

LINEÆ.

Linum usitatissimum, *Linn., Bentl. and Trim., t.* 39. The seeds and oil.

Vernacular.—Alsí, Tisí (*Hind.*), Alishí (*Bomb.*), Alsí-virai (*Tam.*), Masiná (*Beng.*)

History, Uses, &c.—Linseed, called in Sanskrit Atasí, appears to have been but little used as a medicine by the Hindus. The Mahometans have paid more attention to the plant; they consider it to be cold and dry, and that clothes made with the fibre cool the body and lessen perspiration; they recommend fumigation with the smoke for colds in the head and hysteria, and use the tinder to staunch hæmorrhages. Sheriff says if you wish to become thin wear washed linen clothes in the summer but not in winter. The flowers are said to be cardiacal, the seeds aphrodisiacal, and hot and dry. Linseed poultice is recommended for gouty and rheumatic swellings; as an emollient the mucilage is dropped into the eye; with honey it is prescribed in coughs and colds. The roasted seeds are said to be astringent. In Western India, the unripe fruit is used as a vegetable. Flückiger and Hanbury in their Pharmacographia (p. 89) give a summary of the history of the plant in the West, and trace its use back to the 23rd century, B. C. It is the λίνον of Dioscorides and the Linum of Pliny.* Gallesky (1767) strongly advocated the use of Linseed oil in painter's colic and other spasmodic affections of the bowels.

Description.—The capsule, which is globose, splits into 5 carpels, each containing two seeds separated by a partition. The seeds are of a flattened elongated ovoid form, with an acute edge, and a slightly oblique point blunt at one end. They have a brown glossy polished surface, which under a lens is seen to be marked with extremely fine pits. The hilum occupies a slight hollow in the edge just below the apex. The testa encloses a thin layer of albumen surrounding a pair of large cotyledons having at their pointed extremity a strait embryo. The seeds of different countries vary from $\frac{1}{4}$—$\frac{1}{6}$ of an inch in length, those produced in warm regions being the largest. In India a white variety is sometimes met with. When immersed in water, the seeds become surrounded by a thin, slippery, colourless mucous envelope, which quickly dissolves as a neutral jelly, while the seed slightly swells and loses its polish. (Pharmacographia, p. 90.)

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* Dios. ii., 94. Plin. 1, 1.

Chemical composition.—The following summary is extracted from the Pharmacographia:—"The constituent of chief importance is the fixed oil which the seed contains to about ⅓rd of its weight. The proportion obtained by pressure on a large scale is 20—30 % The oil when pressed without heat and when fresh has but little colour, is without unpleasant taste, and does not solidify till cooled to −20° C. The commercial oil is dark yellow, and has a sharp repulsive taste and odour. On exposure to the air, especially after having been heated with oxide of lead, it quickly dries up to a transparent varnish, consisting chiefly of linoxyn, C^{32} H^{54} O^{11}. The crude oil increases in weight 11—12 %, although at the same time its glycerin is destroyed by oxidation.

By saponification, Linseed oil yields glycerin, and 95% of fatty acids, consisting chiefly of Linoleic acid, C^{16} H^{26} O^{2}, accompanied by some oleic, palmitic and myristic acid. The action of the air transforms Linoleic acid into the resinoid oxylinoleic acid, C^{16} H^{26} O^{5}. Linoleic acid appears to be contained in all drying oils; notably in that of poppy seed. It is not homologous either with ordinary fatty acids, or with the oleic acid of oil of almonds, C^{18} H^{34} O^{2}.

The viscid mucilage of Linseed cannot be filtered till it has been boiled. It contains in the dry state more than 10 % of mineral substances, when freed from which and dried at 110 ° C., it corresponds, like althæa mucilage, to the formula C^{12} H^{20} O^{10}. The seeds by exhaustion with cold or warm water afford of it about 15 %. By boiling nitric acid it yields crystals of mucic acid. Its chemical relations are therefore those of gum and not of soluble cellulose. Linseed contains about 4% of nitrogen, corresponding to about 25 % of protein substances; after expression of the oil, these substances remain in the cake.

In the ripe state, Linseed is altogether destitute of starch, though this substance is found in the immature seed in the very cells which subsequently yield the mucilage. The water retained by the air-dry seed is about 9 %. The mineral constituents of Linseed, chiefly phosphates of potassium, magnesium, and calcium, amount on an average to 3 %, and pass into the mucilage. By treating thin slices of the testa and its adhering inner membrane with ferrous sulphate, it is seen that this tegument contains a small quantity of tannin."

Commerce.—In 1872, India exported to the United Kingdom £1,144,942 worth of Linseed. In 1882 the total exports were valued at more than £3,000,000.

ZYGOPHYLLEÆ.

Tribulus terrestris, *Linn., Wight Ic., t.* 98. The fruit.

Vernacular.—Chota Gokhrú (*Hind.*), Lahana Gokrú (*Bomb.*), Nerunjí (*Tam.*)

History, Uses, &c.—This plant is the Gokshurí and Ikshugandha of Sanskrit writers. The Hindus use the fruit and sometimes the whole plant; they regard it as having cooling, diuretic, tonic and aphrodisiac properties, and use it in gonorrhœa and dysuria; it is one of the ten plants which go to form the Dasamula Kvatha, a compound decoction often mentioned in Sanskrit works. The ten plants are Desmodium Gangeticum, Uraria lagopodioides, Solanum Jacquini, Solanum Indicum, Tribulus terrestris, Ægle marmelos, Calosanthes Indica, Gmelina arborea, Stereospermum suaveolens, and Premna spinosa. The first five of these are called Hrasva pancha mula, or the five minor plants, and the last five, Vrihat pancha mula, or the five major plants.

T. terrestris is the Khasak or Hasak of the Arabs and Persians; it is well described by Ainslie, who says:—"It is a common plant near the Dardanelles, and is called in modern Greek τριβόλια. Dioscorides calls it τρίβολος and Pliny tribulus; they both describe two kinds, '*terrestris*' and '*aquaticus.*' The latter is the Trapa natans, Linn., or Water Chestnut.* In the Pharmacopœia of India its use as a diuretic in Southern India is noticed."

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*Dios. iv., 16. Plin. 21, 15; 16, 58.

Description.—Tribulus terrestris has a slender fibrous root, from which spring four to five delicate stalks, spreading flat on the ground; these are hairy and extend to 2½ feet in length; the leaves are pinnated, leaflets 5 to 6 pairs, nearly round. The flowers are axillary on short peduncles, and composed of five broad obtuse yellow petals; these are succeeded by a roundish five-cornered fruit, about the size of a marble, armed with prickles; this ripening divides into five cells, each armed with four strong sharp thorns, and containing several seeds. The cocci are wedge-shaped, yellowish when ripe, the external convex surface being rough between the thorns. When all five are *in situ*, the fruit presents ten thorns pointing towards the peduncle, and ten pointing outwards round the circumference; the latter are developed first. This may account for the statement in some books that each coccus has only two spines. The seeds are oily, and enclosed in very hard stony cells. The taste is faintly aromatic and rather agreeable.

Commerce.—The fruit is chiefly collected in the sandy districts of Guzerat and Kattiawar; it is always obtainable in the drug marts of Western India. Value, Rs. 5 per Surat maund of 37½ lbs.

Tribulus alatus, *Delile.*

Vernacular.—Nindo-trikund, Latak (*Sind*).

The fruits are used for the same purpose as those of Tribulus terrestris. The plant is common in Sind, the Punjab, and Beloochistan. Fruit pyramidal, broadly winged; cocci hirsute, two-seeded; spines confluent. (Murray.)

Fagonia arabica, *Linn., Wight Ill. i., t.* 64. The plant.

Vernacular.—Dhamása (*Bomb.*)

History, Uses, &c.—This plant is common on grain fields in the Deccan; it is suffrutescent, much branched, with opposite two-stipuled leaves; the stipules are often thorny, leaflets linear-cuspidate; the wood of the stem is white and very hard, covered with a ragged, light brown bark, which becomes slimy and mucilaginous when moistened; taste mucilaginous. Dhamása has a great reputation as a suppurative in cases of abscess from thorns, &c.; it is also used for cooling the mouth in stomatitis, the juice being boiled with sugar-candy until quite thick, and a small quantity allowed to dissolve in the mouth frequently; the juice is thought to prevent suppuration when applied to open wounds. The dried plant can be obtained in all the druggists' shops in Bombay. Value, Rs. 2½ per Surat maund of 37½ lbs. Fagonia in Sind and Afghanistan is a popular remedy for fever among the Hill people.

GERANIACEÆ.

Oxalis corniculata, *Linn.*, *Wight Ic.*, *t.* 18; *Fl. Græc.*, *t.* 451. The plant.

Vernacular.—Amrulsák, Chuka-tripati (*Hind.* and *Beng.*), Ambutí, Bhuí-sarpatí (*Bomb.*), Puli-yárai (*Tam.*)

History, Uses, &c.—This plant, called in Sanskrit works Amlalonika and Chángerí, is considered by the Hindus to be cooling, refrigerant, and stomachic. The fresh juice is given to relieve intoxication from Datura, and is said to be useful in dysentery and prolapsus of the rectum. (Hindu Materia Medica, Dutt.) Chakradatta gives the following formula for preparing a ghrita with this herb: *Changeri ghrita*—Take of clarified butter 4 seers, curdled milk (dadhí) 16 seers, leaves of Oxalis corniculata beaten into a paste 1 seer. Boil together in the usual way, and prepare a ghrita. In the Concan the plant is rubbed down with water, boiled, and the juice of white onions added: this mixture is applied to the head in bilious headache. Mahometan writers briefly notice the plant as being used by the Hindus. Ainslie describes it, and mentions its use as a cooling medicine in doses of two teaspoonfuls twice a day.

The plant is a native of Europe, and is possibly the *οξαλίς* of the Greeks and the Oxalis of Pliny.*

Description.—O. corniculata is one of the most troublesome garden weeds in Bombay; the stems are decumbent, rooting; leaves palmately trifoliolate; leaflets obcordate, pubescent; peduncles 2 to 5-flowered; flowers yellow, capsule linear, oblong, many-seeded, densely pubescent; seeds transversely ribbed. All parts of the plant have an acid taste.

Chemical composition.—The different species of Oxalis contain acid potassium oxalate.

RUTACEÆ.

Ruta graveolens, *Linn. var. angustifolia*; *Bot. Mag.* 2311. The herb.

Vernacular.—Sudáb (*Hind.*), Sutáp (*Bomb.*), Arvada (*Tam.*)

History, Uses, &c.—The leaves dried and burnt are used by the Hindus for the purpose of fumigating young children suffering from catarrh; they are also used fresh, bruised and mixed with arrack as an external remedy in the first stages of paralytic affections; dried and powdered they are prescribed in conjunction with aromatics in cases of dyspepsia; they are considered to be injurious to pregnant women; an opinion also entertained by Dioscorides.† Rue was held in high estimation by the Greeks and Romans, and was a principal ingredient in the celebrated antidote of Mithridates. Pliny notices it in several parts of his Natural History, and calls it one of the best medicinal herbs.‡ Celsus says of Rue, "Urinam movet, sensus excitat, purgat, mollit." Hippocrates considered it to be resolvent and diuretic, and notices it in his chapter on female diseases. The Arabians class Rue among their attenuentia, vesicatoria and stimulantia. The author of the Makhzan-el-Adwiya describes three kinds—garden, wild, and mountain

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* Plin. 20, 21. According to Sibthorb, Rumex acetosa was the *οξαλίς* of the Greeks. The modern Greek name of Oxalis corniculata is *μοσχόφιλο.*

† Dios. iii., 47.

‡ Plin. 19, 8; 20, 13.

Rue. He considers it to be hot and dry in the third degree, to increase the mental powers, to act as a tonic and digestive, and to increase the urinary and menstrual excretions. He also states that it acts as an antaphrodisiac and causes abortion when given to pregnant women. The diseases in which it is recommended are so numerous that I must refer the reader to his article "Sudáb." Early European practitioners considered Rue to be antispasmodic, stimulant and emmenagogue, and prescribed it in hysteria and flatulent colic. Boerhaave extols its virtues in promoting perspiration. In the Schola Salerni, the following lines occur:—

> "Ruta facit castum; dat lumen, et ingerit astum.
> Cocta facit ruta, de pulicibus locatuta."

Rue is the *Herb Grace* of old English writers, and is still much used as a domestic remedy. Alibert says of it, "Cette plante a un grande action sur le système nerveux, et particulièrement sur le système uterin. Beaucoup de femmes en prennent dans les menstrues laborieuses." The dose of the powdered leaves is from ten grains to a scruple or more, twice or thrice daily. Rue occupies a corner in most Bombay gardens; it grows freely, but does not generally flower.

Rue is an active irritant, whether applied externally or taken internally. It has been frequently used with success to procure abortion; sometimes it produces painful vomiting, always great prostration, confusion of mind, cloudy vision, feebleness and slowness of pulse, coldness of the extremities, and twitching of the limbs; in pregnant women the drug produces pain in the back, bearing down, and frequent micturition, followed by pains and abortion about ten days after the commencement of its administration. Oil of Rue has been observed to produce similar symptoms with increased frequency and diminished tension of the pulse; on the other hand, when an infusion of the dry leaves was used, the pulse fell from 80 to 69 in three hours.—(Van de Warker, Criminal Abortion, 1872.)

Description.—The variety augustifolia is thus described in Hooker's 'Flora of British India':—"Leaves petioled, triangular ovate, decompound, segments various, corymbs spreading, bracts lanceolate, sepals triangular acute, petals ciliate, capsule obtuse, shortly pedicelled.

Chemical composition.—The essential oil, when purified by a few rectifications, is somewhat viscid ; has a specific gravity of 0·837 at 18° ; a strong disagreeable odour, like that of the plant ; a slightly bitter aromatic taste ; boils at 228°—230°, and solidifies between + 1° and 2°, to shining crystalline laminæ, resembling those obtained from Anise oil. Oil of Rue is chiefly a mixture of a hydrocarbon with an aldehyde or ketone belonging to the series, $C^n H^{2n} O$. This compound, separable by alkaline bisulphites, was formerly regarded, according to the investigations of Gerhardt and of Cahours, as capric or nitric aldehyde, $C^{10} H^{20} O$. But Greville Williams has shown that the crude oil contains two such compounds, viz., $C^{11} H^{22} O$ and $C^{12} H^{24} O$, the latter in comparatively small quantity ; and this result has been confirmed by Harbordt. The portion of Rue oil, which does not combine with alkaline bisulphites, is separable into a more volatile portion, having the composition of Turpentine oil, and a less volatile portion, which appears to be isomeric with Borneol, but boils at a lower temperature. For a fuller account of the chemistry of Rue, see Watt's Chem. Dict., Vol. V., p. 132.

Commerce.—Rue is cultivated in the Bombay Presidency for medicinal use. It is also imported from Persia. Value, Re. ¼ per lb.

Peganum* Harmala, *Linn.*, *Lam. Ill.*, 401. The seeds.

Vernacular.—Hurmal (*Hind.*), Hurmal, Hurmaro, Ispand (*Bomb.*)

History, Uses, &c.—In native works on Materia Medica, Hurmul is described as an alterative and purifying medicine in atrabilis, and also in diseases supposed to arise from cold humors, such as palsy, lumbago, &c.; it is also said to stimulate the sexual system both in the male and female, increasing the flow of milk and menses in the latter. For administration a concentrated decoction is mixed with sweet oil and honey, or the crushed seeds are boiled in wine down to one-fourth of the original bulk of the latter, and the mixture strained (*vide* Makhzan-el-Adwiya, article Hurmal). Recently, Dr. P. Gopal, a medical graduate of the Bombay University, has experimented with this drug. He informs me that the infusion or tincture acts as a stimulant emmenagogue, and produces slight intoxication like *Cannabis Indica.* He gave the tincture in ½ drachm doses to a female suffering from amenorrhœa, and it had the effect of producing a free menstrual discharge; he further says that it is sometimes used by the native midwives to procure abortion. Dr. P. Gopal believes that it has properties in common with Ergot, Savine, and Rue. The equal activity of watery and spirituous preparations may be explained by the fact that the red resinous colouring matter is a secondary product formed by the oxidation of the alkaloid Harmaline; it is only produced after digestion of the seeds in spirit. In Persia P. Harmala is called Sipand; when sprinkled upon burning coals it is supposed to avert the malignant influence of the evil eye. Popular allusions to it in Persian books are frequently met with.

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* *πήγανον.* The Greeks and Romans speak of two kinds of Peganon or Rue, '*garden' and* '*wild, or, mountain Rue,*' and Apuleius Platonicus gives *armala* as the Syrian name of Ruta hortensis, or Garden Rue. He mentions Peganon agrion separately, and says the Italians call it Ruta montana.

Description.—The drug, as found in the bazaar, consists of the seeds mixed with a few pedicels surmounted by the five partite calyx and portions of the three-celled, three-furrowed capsule. The seeds are of a dull greyish brown colour, irregularly angular, and about ⅛ of an inch long; they have a heavy narcotic odour when crushed, and a bitter taste.

Microscopic structure.—The testa, which is rough and squamous, may be seen to consist of two rows of large honeycombed cells, the walls of which contain brown colouring matter. The kernel is greenish, and when a section is placed in glycerine for examination, it immediately developes a fine green fluorescence; it consists of two longish cotyledons surrounded by albumen; the cell contents of both appear granular.

Chemical composition.—Some seeds crushed, and treated with water for a few minutes, produced after filtering a pale yellow fluid with a marked green fluorescence; this was destroyed by alkalies and restored by acids. A further examination of the seeds was made by exhausting them with rectified benzine, Spt. Rectificatus, and water acidulated with hydrochloric acid. The benzine solution was of a pale yellow colour, and upon evaporation yielded a rich reddish brown oil, having no very marked odour, and a nauseous taste. The tincture made with rectified spirit was of a deep red, like Tra. Lavandulæ Comp., very opaque and highly fluorescent. Upon evaporation it yielded a soft extract of the colour of Dragon's blood, and having the odour of *Cannabis Indica.* This, when exhausted with water, gave a pale red solution with a green fluorescence, which, when treated with a solution of oxalate of ammonia, threw down the red colouring matter and became pale yellow, but retained its fluorescence. The remainder of the spirituous extract, after complete exhaustion with water, consisted of a soft resin of a deep carmine lake colour, having a heavy narcotic odour like resin of *Cannabis Indica.* The portion treated with acidulated water yielded a pale sherry-coloured fluorescent solution, which, upon evaporation, gave a soft yellow extract, with an odour like honey; the greater part of this dissolved in rectified spirit, forming a yellow fluorescent solution; this, after filtration, was evaporated to a thin syrup, and upon cooling formed a dark brown mass, which was not further examined, as the alkaloids contained in the seeds have already been fully investigated. For an account of them I must refer the reader to Watt's Chem. Dictionary, article "Harmaline." Harmaline is a drab-coloured powder which stains the fingers yellow when moistened. Harmine is also a drab-coloured powder.

Commerce.—Hurmal seed is imported from Persia, but the plant has been introduced into India by the Mahometans, and in this Presidency is to be found in abundance among the ruins of Bíjapur. Value, Rs. 2½ per Surat maund of 37½ lbs.

Xanthoxylum Rhetsa, *D. C., Rheede Hort. Mal. v., t. 34.* The carpels.

Vernacular.—Tessul, Koklí, Chirphal, Triphal (*Bomb.* and *Goa*), Rhetsa maum (*Tel*).

History, Uses, &c.—The fruit of this and several other species of the same genus appear to have long been in use in the East on account of their aromatic and stimulating properties. Under the name of Fághureh, Arabian and Persian writers on Materia Medica describe a fruit which is probably that of X. Rhetsa. The author of the Makhzan-el-Adwiya gives Kabábeh-i-dahan-kusháda (open-mouthed Cubebs) as the Persian name. He describes it as being aromatic, as large as a chick pea (seed of Cicer arietinum), the colour of a nut, half split open and containing a roundish black shining seed; moreover, he says, that it comes from Southern India. As X. Rhetsa abounds on the Western Coast from Goa southwards, it is highly probable that the Arabs, who traded much with the people of the Malabar Coast, allude to its fruit when they speak of Fághureh. The Mahometan physicians consider Fághureh to be hot and dry, and to have astringent, stimulant, and digestive properties. They prescribe it in dyspepsia arising from atrabilis; also in some forms of diarrhœa. The inhabitants of the Western Coast use the carpels in their curries as a condiment, especially with fish. The bark of the Xanthoxyleæ, besides being aromatic, contains a bitter crystalline principle; that of the roots of X. Rhetsa is reputed in Goa to be purgative of the kidneys. The fruit with ajwan seeds is powdered, steeped in water and distilled, and the distillate given as a remedy for cholera. In rheumatism the fruit is given in honey, alone, or with other spices.

Description.—X. Rhetsa abounds in the Goa territory. The fruit is a small, roundish-ovate, somewhat flattened capsule, about the size of a large pea; it has a fleshly dotted pericarp, which in the dry drug forms a rough dark brown aromatic covering to the tough woody shell enclosing the seed. The small peduncles of the fruit often remain attached. The seed is single, of the shape of a lentil, blue black, and shining. The capsules when ripe dehisce and the seeds fall out. Upon pressing the pericarp with the nail, the essential oil exudes; it has an agreeable lemon odour, and tastes hot and aromatic; the seeds have a peppery flavour.

Microscopic structure.—Sections of the capsule show that the outer portion of the pericarp is thickly studded with cells containing the essential oil, and that the elasticity of the capsules is due to the presence of strong bands of spiral fibres. The dry open capsules, when soaked in water, close, and resume the shape which they had before dehiscence.

Chemical composition.—The bitter crystalline principle present in the bark of the Xanthoxyleæ, and formerly called Xanthopicrite, has been recognised as identical with berberine (Dyson Perrins, in Trans. Chem. Soc., 1862). The essential oil of the pericarp, and acrid principle of the seeds of X. Rhetsa does not appear to have been examined. Dr. Stenhouse has detected in the fruit of X. alatum an aromatic essential oil (Xanthoxylene), which, when pure, is a hydrocarbon isomeric with oil of turpentine, and likewise a stearopten (Xanthoxylin) found floating on the water distilled from the fruits, and also separable from the crude essential oil.

Other species.—In Eastern Asia several species of Xanthoxylum are used as condiments and drugs. X. piperitum of Japan has in all its parts the warm pungent flavour of Anacyclus Pyrethrum. Several Chinese species bear the significant name of Hoatsiao (Pepper flower); X. alatum and zeylanicum are also prized as bitter and aromatic. X. budrunga of India is digestive, stomachic, and stimulant. X. triphyllum, now Evodia Roxburghiana, has similar properties with X. Rhetsa; it grows on the hills of the Western Coast about Bombay. The fruit is about the size of a pepper-corn, coriaceous, and rugose, the seeds shining and of a blue black colour. The aromatic and pungent fruit of X. hastile (Nepali Dhania, Tumri), resemble coriander in appearance, and are used as an aromatic stimulant.

Toddalia aculeata, *Pers., Wight Ill., t.* 66; *Lam. Ill. ii.,* 116; *Bentl. and Trim., t.* 49. The root.

Vernacular.—Janglí kalí Mirchí (*Hind.* and *Bomb.*), Milakaranai (*Tam.*)

History, Uses, &c.—Ainslie mentions the use of this plant in Southern India. He says:—"Malakarunnay (Scopolia aculeata, Smith,) is the Tamool name of a small white root about the third part of an inch in diameter, the bark of which is bitter, pungent and sub-aromatic, and is considered as stomachic and tonic. It is given in a weak infusion to the quantity of half a teacupful in the course of the day; the leaves are also sometimes used for the same purpose." Roxburgh, in the "Flora Indica," describes the plant fully, and says: "That every part of this shurb has a strong pungent taste; the roots, when fresh cut, particularly so. The fresh leaves are eaten raw for pains in the bowels; the ripe berries are fully as pungent as black pepper, and with nearly the same kind of pungency; from these the natives prepare an excellent pickle." The fresh bark is administered by the Telinga physicians for the cure of that sort of remittent commonly called "hill fever." Flückiger and Hanbury have the following account of the history of Toddalia Radix:—" It is from this and other species of Toddalia, or from the allied genus Zanthoxylum, that a drug is derived, which, under the name of Lopez root, had once some celebrity in Europe. This drug was first made known by the Italian physician Redi, who described it in 1671 from specimens obtained by Pigneiro at the mouth of the river Zambesi, in Eastern Africa, the very locality in which, in our times, Toddalia lanceolata, Lam., has been collected by Dr. Kirk. It was actually introduced into European medicine by Gaubius in 1771 as a remedy for diarrhœa, and acquired so much reputation that it was admitted to the Edinburgh Pharmacopœia of 1792. The root appears to have been sometimes imported from Goa, but its place of growth and botanical origin were entirely unknown, and it was always extremely rare and costly. It has long been obsolete in all countries except Holland, where, until recently, it was to be met with in the shops." In the Pharmacopœia of India it is stated that Toddaliæ Radix is probably a remedy of great value in constitutional debility, and in convalescence after febrile and other exhausting diseases. It is very strongly recommended by Dr. Bidie, of Madras. T. aculeata is found in the southern part of the Bombay Presidency. I have not seen the drug used in Bombay, nor does it appear to be known in the shops.

Description.—The root, as supplied from Madras, is woody and in cylindrical flexuose pieces, from ½ to 1½ inches in diameter. The bark is about $\frac{1}{12}$th of an inch thick, and consists of a soft yellow corky external layer, wrinkled longitudinally, a thin bright yellow layer and a firm brown middle cortical layer and liber. The wood is hard, yellow, and without taste or smell: its pores are arranged in a concentric manner; the medullary rays are numerous and narrow.

Microscopic structure.—The bark is remarkable for the number of large cells filled with resin and essential oil, which are distributed throughout its cortical tissue. The parenchyme cells contain starch and raphides. The vascular system is loaded with yellow resin.

Chemical composition.—The bark contains a resin and essential oil, neither of which have been properly examined. In the aqueous infusion tannic acid produces an abundant precipitate of a bitter principle, probably of an indifferent nature. Flückiger and Hanbury were unable to detect Berberine in the bark.

Murraya Kœnigii, *Spreng.*, *Wight Ic.*, *t.* 13; *Roxb. Cor. Pl. ii.*, *t.* 112. The leaves.

Vernacular.—Karhí-nímb, Gora-nímb, (*Bomb.*), Karu-veppilai, Kari-vepachettu (*Tam.*), Barsunga (*Beng.*)

History, Uses, &c.—This small tree, in Sanskrit Paribadhra, is found wild on the mountainous parts of the Western Coast; it is also much cultivated for the sake of the leaves, which are used more as a condiment than a medicine. The bark and root have stimulant properties, and are applied externally to parts bitten by venomous animals ; the leaves are given raw in dysentery, and are also applied externally to cure eruptions. (Roxb.) An infusion of the toasted leaves, acccording to Ainslie, is used by the Hindus to stop vomiting. The plant is noticed in the Pharmacopœia of India as having tonic and stomachic properties. The leaves are much used in Bombay as an ingredient in curries and chutnies, and are sometimes given in decoction with bitters as a febrifuge.

Description.—The leaves are pinnate, the leaflets 19 to 21, 1¼ inch to 2 inches long, alternate, unequally oblique at the base, irregularly ovate, serrated, pubescent, upper surface dark green, dotted, under surface of a lighter colour, venation reticulated, prominent, petioles red, odour powerful, penetrating, taste peculiar, moderately pungent, bitter, and acidulous. The bark has the same taste and odour as the leaves ; the thin walled cells of its parenchyma contain numerous minute oil globules.

Chemical composition.—All parts of the plant abound in essential oil and contain a bitter principle, neither of which appear to have been examined.

Commerce.—The dried leaves are always obtainable in the bazaar; they retain their fragrance well.

Other species.—The leaves of Murraya exotica (Kounti), a small evergreen shrub with white sweet smelling flowers, have the odour of box leaves, and have a very pungent taste. They have from 5 to 8 elliptic, ovate, tapering leaflets, acute at the base, shining, coriaceous and dotted, with prominent venation. The bark of this shrub is insipid, but its parenchyma abounds in oil globules. M. exotica is much cultivated in gardens, but is not made use of in any way. De Vry has separated a glucocide from the flowers, which he has named *Murrayin*, $C^{18} H^{22} O^{10}$.

Atalantia monophylla, *Corr., Wight Ic., t.* 1611; *Rheede Hort. Mal. iv., t.* 12.

Vernacular.—Matangnár, Mákar-limbú (*Bomb.*), Katkorandú (*Tam.*)

Ainslie tells us that a warm, pleasant smelling oil is prepared from the berry of this plant, which in Southern India is considered a valuable external remedy in chronic rheumatism and paralysis. In the Concan the leaf-juice is an ingredient in a compound liniment used in Hemiplegia (Wanaushadí Prakasha, 1, 404).

Description.—A. monophylla is a large, thorny, climbing shrub, common on the ghauts above Bombay; the leaves are fragrant like those of the orange; the berry is globular, yellow, about 1 inch in diameter, and divided into four cells by membraneous septa, one cell is generally abortive; pulp like that of a lime but very scanty; each cell contains one seed $\frac{3}{4}$ of an inch long and $\frac{1}{2}$ an inch broad, having one convex and two flat surfaces like the segment of an orange; the rind of the fruit has a faint odour of orange peel and abundant oil cells. The oil prepared by the natives is obtained by powdering the seeds, which are very aromatic when fresh, sprinkling them with sweet oil and expressing, the result is a dark green, pleasant smelling oil, which communicates an agreeable warmth to the skin when rubbed on it. The seeds pressed by themselves yield no fatty oil, but the press cloths are moistened with essential oil.

Limonia acidissima, *Linn., Rheede Hort. Mal. iv., t.* 14; *Roxb. Cor. Pl., t.* 86.

Vernacular.—Beli (*Hind.*), Rán-limbú (*Bomb.*)

History, Uses, &c.—Common in the hilly districts of Western India, Rheede calls it 'Tsjerou-katou-naregam,' and gives 'Limonis da folha cruzado' as the Portuguese name. Regarding its medicinal properties, he says: "Cœterum arboris hujus folia præsentaneum habentur curandæ epilepsiæ remedium. Radix alvum movet, sudores expellit, nec non cruciatibus colicis et cardialgiæ medetur. Fructus siccati stomachum roborant, ac alimentorum in eo fermentationem læsam restituunt; adhæc acri ex variolis, febribusque malignis et pestilentialibus contagioso potenter resistunt, atque variis venenis præstantissimum censentur antidotum; quamobrem magni æstimantur, et ab Arabibus aliisve mercatoribus avide expetuntur." Graham, Drury and others copy from Rheede, but Drury adds that the fruit is used in Java instead of soap. (Confer. Lindl.)

Description.—A. acidissima is a shrub with tripinnate leaves and winged petioles; the root is yellow, bitter and aromatic; the fruit globular, the size of a grape, with yellowish-red rind like that of the lime, and a scanty very acid flesh-coloured pulp with some bitterness and aroma; it is four-celled, but usually contains only three seeds of the colour of orange pips. The fruit is eaten as a stomachic by the hill tribes, but I have never seen it in the Bombay market. The cultivated *sour lime* in a dried state is often offered in large quantities.

Paramignya monophylla, *Wight Ill. I.* 109, *t.* 42. The root.

Vernacular.—Kurwi Wágetí, Karí-wágetí (*Bomb.* and *Goa*).

History, Uses, &c.—In the Concan the root is given to cattle suffering from bloody urine, or bloody fluxes from the abdomen. When on a visit to Goa, I observed that the country people made use of the root as an alterative tonic.

Description.—A scandent, prickly shrub, which bears a pulpy four-celled yellow fruit, the size of a small apple. The root is long and woody; the pieces selected for use are about as thick as the finger, and covered with a somewhat scabrous brown bark, which has a bitter saltish taste. Sections of the bark placed under the microscope show from ten to twelve rings, composed of bundles of liber cells closely set, and encased in an armour of crystalline cubes. Kurwí Wággetí must not be confounded with Wágetí, the Marathí name for Capparis zeylanica, *Linn.*

Citrus, several species. *Bentley* and *Trimm., tt.* 50 *to* 54. The fruit.

Vernacular.—Nárangí, Oranges; Limú, Lemons; Turúnj, Mahalung, Citrons (*Hind.* and *Bomb.*) Kich-chilip-pazham, Oranges; Elumich-cham-pazham, Lemons; Nara-dabba, Citrons (*Tam.*)

History, Uses, &c.—Orange and Lemons were introduced into Europe from India by the Arabians, and were used by Avicenna and the early Arabian physicians medicinally. According to Dutt (Hindu Materia Medica, p. 126,) the different species of Citrus described by Sanskrit writers are as follows:—

Jambira,	Citrus acida,	Roxb. Var.	3
Limpáka,	do.	do.	1
Nimbuka,	do.	do.	2
Vijapura,	do.	do.	7
Madhukarkatika,	do.	do.	9
Mahalunga,	Citrus medica.		
Karuná,	do.	do. Var.	
Nagaranga,	Citrus aurantium.		

" The variety of Citrus acida, called Jambira, yields the Lemon juice used in medicine. Limpáka is much used as a sauce by the natives. The fruits are cut vertically into two pieces, and the fresh juice is sprinkled on soup, dal, curry, &c., to which it imparts a pleasant acid taste and agreeable flavour. A pickle of this fruit in its own juice and salt is a popular and effectual medicine for indigestion brought on by excess in eating, or by indigestible articles of diet. The fruits are first rubbed upon a stone, or their rind scraped a little so as to thin it; they are then steeped in juice obtained from other fruits of the sort, and exposed to the sun for a few days with the addition of common salt; when crisp and of a brown colour, they are preserved in jars. This preparation is called Járak nebu (digestive lemon) in Bengal. The variety called Nimbuka has larger fruit than Limpáka, and is also used as sauce, like the latter, but is inferior to it in flavour and fragrance. Citrus aurantium is called Kamla nebu in Bengali; the variety grown in the plains has an acid taste, and is called Nárengá. The Sanskrit term Karuná nimbu is variously translated by different authorities. Wilson in his Sanskrit Dictionary calls it Citrus decumana. In the Hortus Bengalensis it is translated Citrus medica, while Drury and other Madras authorities make it Citrus limonum. The Sabdakaldruma does not give any synonym or vernacular term for it, so that it is difficult to say what form is really meant. In the vernacular the term Káruna is applied to a variety of Citrus medica (in the Makhzan-el-Adwiya it is given as the Hindi for Naranj), Citrus decumana has no Sanskrit name. In the vernacular it is called Batavi nebu, from its having been orignally brought from Batavia. Madhukarkatika is probably the sweet lemon, or possibly the citron. Lemon juice is considered cooling, refrigerant, stomachic and useful in dyspepsia, thirst, fever, &c. Fresh lemon juice is recommended to be taken in the evening, for the relief of dyspepsia with vomiting. It enters into the composition of several carminative medicines, such as the Hingváshtaka, &c. In rheumatic affections, such as pleurodynia, sciatica, lumbago, pain in the hip joints, &c., Sárangadhara recommends the administration of lemon juice with the addition of Yavakshára (impure carbonate of potash) and honey. The root of the variety of Citrus acida, called Limpaká, is one of the principal ingredients in a preparation of Iron called Yakridari lauha." Mahometan writers divide the genus Citrus into Utrunj, citrons; Náranj, oranges; and Limú, lemons; they describe two varieties of Citron—the large, which is broad and obtuse at the base, and the small, both ends of which taper equally; both are yellow and fragrant, but the perfume of the small variety is greatest; the rind of both is bitter; the pulp of the small bitter, of the large sweet. Citron rind is said to be hot and dry, the pulp cold and dry if acid, but cold and moist if sweet; the seeds, leaves, and flowers hot and dry. The juice is described as refrigerent and astringent and is said to be digestive and to check bilious vomiting; the rind is tonic and digestive, and is best administered preserved with honey or sugar. The author of the Makhzan-el-Adwiya states that if the rind of a citron be steeped in a vessel of wine it will convert it into vinegar. He also quotes a Mahometan Hadis (tradition), to the effect that Satan will not enter a house in which citrons are kept. The essential oil is extracted by means of sweet oil from the powdered rind, it is considered hot and dry, and is used as a stimulating liniment. The essential oil of the flowers and leaves is extracted in the same way, and is considered to have the same properties. Hakíms pretend to dissolve jewels and pearls in citron juice. The seeds are generally stated to be alexipharmic. With regard to oranges, the Mahometan writers describe the best kind as large, thin-skinned, and smooth; they say that the rind and flowers are hot and dry, the pulp cold and dry, and recommend the fruit in colds and coughs, when febrile symptoms are present; it is best administered baked with sugar. The juice is valuable in bilious affections, and stops bilious diarrhœa. The orange is the safest of the acid fruits; the peel is useful for checking vomiting, and the prevention of intestinal worms. Orange poultice is recommended in some skin affections, such as psoriasis, &c. Oranges are considered to be alexipharmic and disinfectant; orange water stimulating and refreshing. The essence is extracted by oil from the rind and flowers, and is used as a stimulating liniment. Lemons are stated in the Makhzan-el-Adwiya to be of many kinds; those which are thin-skinned and about the size of a hen's egg are most esteemed; others are described as ovoid and as large as a goose egg. Of all, the juice is the most valuable part; the peel has the same properties as orange peel, but is weaker. The juice is stated to be cold and dry, or, according to some, cold and moist; to be detergent, useful in bilious headaches, and vomiting caused by excess of bile; to purify the blood in scorbutic states of the system; preserved with sugar or honey lemons are recommended for sore thorat, and are considered to act as a detergent; they are administered before purgatives to prepare the body for them, and afterwards to check excessive action. Hakíms pretend to dissolve jewels and pearls in the juice. The seeds are said to be alexipharmic, and the leaves to have the same properties as those of the citron. Sweet limes and crosses with the orange and citron, produced by tying the trees together, are considered inferior in medicinal properties. For the history and uses of the genus Citrus in Europe, the Pharmacographia of Flückiger and Hanbury may be consulted. In the neighbourhood of Bombay, orange and lime trees are cultivated as ornamental shrubs. Besides these, two marked half wild varieties which have evidently sprung from seed, are to be met with in most gardens. One has a fruit the size and colour of a lemon, but tuberculated like the citron; its rind has a lemon flavour, and the pulp is very acid. The other has a fruit like the Seville orange, but smaller, and a bitter acid pulp; neither of them are made use of. The Citrus decumana is extensively cultivated for sale, and the Bombay fruit is famous for its size and flavour. Gibson tells us that the fruit of Citrus Bergamia (the common sour lime of India) eaten daily with salt, is a remedy of the utmost importance in enlargement of the spleen.

Microscopic structure of Orange and Lemon Peel.—The epidermis exhibits numerous stomata; the parenchyme of the pericarp encloses large oil cells, surrounded by small tabular cells. The inner spongy tissue consists of branched cells separated by intercellular spaces. The outer layers of the parenchyme contain numerous solid yellow bodies, which probably consist of Hesperidin; large crystals of oxalate of calcium are also to be seen, and in the interior tissue vascular bundles.

Chemical composition.—The following summary is extracted from the *Pharmacographia*:—Lemons, as well as other fruits of the genus *Citrus*, contain a bitter principle, *Hesperidin*, of which E. Hoffmann obtained 5 to 8 per cent. from unripe bitter oranges. He extracted them with dilute alcohol, after they had previously been exhausted by cold water. The alcohol should contain about 1 per cent. of caustic potash; the liquid on cooling is acidulated with hydrochloric acid, when it yields a yellowish crystalline deposit of hesperidin, which may be obtained colourless and tasteless by recrystallization from boiling alcohol. By dilute sulphuric acid (1 per cent.) hesperidin is broken up as follows :—

$C^{22} H^{26} O^{12}$	=	$C^{16} H^{14} O^{6}$	$C^{6} H^{12} O^{6}$
Hesperidin.		Hesperetin.	Glucose.

Hesperidin is very little soluble even in boiling water or in ether, but dissolves readily in hot acetic acid, also in alkaline solutions, the latter then turning soon yellow and reddish. Pure hesperidin, as presented to one of us by Hoffmann, darkens when it is shaken with alcoholic perchloride of iron, and turns dingy blackish brown when gently heated with it.

Hesperetin forms crystals melting at 223° C., soluble both in alcohol or ether, not in water; they taste sweet. They are split up by potash into phloroglucin and *Hesperetic acid,* $C^{10} H^{10} O^{4}$. On addition of ferric chloride, thin slices of the peel are darkened, owing probably to some derivative of hesperidin or to hesperidin itself. The name hesperidin has also been applied to *yellow* crystals extracted from the *Pomelo,* Citrus decumana, *Linn.,* the dried flowers of which afford about 2 per cent. of this substance. It is, as shewn in 1879 by E. Hoffmann, quite different from hesperidin as described above; he calls it *Naringin,* and assigns to it the formula $C^{23} H^{26} O^{12} + 4 HO^{2}$. Naringin is readily soluble in hot water or in alcohol, not in ether or chloroform. Its solutions turn brownish red on addition of ferric chloride. Lemon juice in addition to citric acid contains 3 to 4 per cent. of gum and sugar, and 2·28 per cent. of inorganic salts, of which, according to Stoddart, only a minute proportion is potash. Cossa, on the other hand, who has recently studied the products of the lemon tree with much care, has found that the ash of dried lemon juice contains 54 per cent. of potash, besides 15 per cent. of phosphoric acid. Stoddart has pointed out the remarkable tendency of citric acid to undergo decomposition, and has proved that when lemons are kept for six months the acid rapidly decreases in quantity and finally ceases to exist, having been all split up into glucose and carbonic acid. Lemon juice may with certain percautions be kept unimpaired for months or even years. (*Op. Cit.,* 2d Ed., p. 116.) To prevent fermentation it should be heated, strained to remove albumen, and stored in well filled bottles.

Commerce.—The Bombay market is supplied with oranges and limes from the Deccan, especially from the district of Aurangabad. The kinds usually met with are: several varieties of Mandarin orange; the common sweet orange; the small round sour lime, with a very thin skin; the sweet lime; and a fruit which appears to be a cross between the sweet lime and orange. Besides these we have the Shaddock or Pummelo in abundance, and occasionally sweet citrons from the Persian Gulf, and sweet oranges from Suez or Zanzibar. Sour limes in a dried state are exported to Arabia.

The varieties of the orange cultivated in Western India (according to the *Bombay Flora*) are:—

1*st*, The Mozambique.
2*nd*, The Cintra, of Portuguese origin.
3*rd*, The China, or red loose-skinned orange.
4*th*, The Cowla.
5*th*, The small China.

The C. Limonum—Portugal Lemon—is cultivated at Dapoorie, where it yields fruit of a fair size and good flavour. (*Op. Cit.*, Part II., p. 13.)

The C. Medica—Citron—is to be seen in gardens, and is much valued for preserving.

Ægle marmelos, *Corr.*, *Bentl. and Trim.*, *t.* 55. The fruit, bark and leaves.

Vernacular.—Bél (*Hind.*, *Beng.* and *Bomb.*), Vilva-pazham (*Tam.*)

History, Uses, &c.—This is a sacred tree amongst the Hindus, its leaves being used in the worship of Siva. On this account it is to be found cultivated everywhere in Hindu gardens. It is considered sacrilegious to destroy it; enormous quantities of the leaves are gathered for use in the temples at certain seasons. In ancient Sanskrit poems it is frequently alluded to as an emblem of increase and fertility. Hindu physicians regard the unripe or half ripe fruit as astringent, digestive, and stomachic, and prescribe it in diarrhœa and dysentery. The ripe fruit is considered aromatic, cooling and laxative. A thick sherbet of the ripe fruit has a reputation among Europeans as an agreeable laxative; the dose is a tumbler-full. The dried pulp of the fruit is called Vilva peshika in Sanskrit. The root bark is used as a remedy in hypochondriasis, melancholia and palpitation of the heart (diseases supposed to be caused by deranged air); it is one of the Dasamula or ten plants (*vide* Tribulus terrestris). The fresh juice of the leaves is given with honey as a laxative and febrifuge; it is used in asthmatic complaints, and with the addition of black pepper in anasarca with costiveness and jaundice; moreover, in external inflammations it is given to correct the supposed derangement of the humours. The Mahometans use the Bel as a medicine; they consider the ripe fruit to be hot and dry, the very young fruit cold in the second degree, and the half ripe fruit cold in the first and dry in the second degree; its properties are described in the Makhzan-el-Adwiya as cardiacal, restorative, tonic and astringent; it is directed to be combined with sugar for administration to prevent its giving rise to piles. The pulp of the half-ripe fruit baked and mixed with sugar and rose water when given on an empty stomach is said to be a good remedy for diarrhœa. Garcia d'Orta, physician to the Viceroy of Goa in the 16th century, describes the Bel fruit under the name of Marmelos de Benguala, and mentions its use in dysentery. Bontius also mentions it. Rheede in his Hort. Malab. (Vol. III., p. 37), notices its use on the Malabar Coast. Ainslie and the authors of the Bengal Dispensatory quote him, but give no further information upon the subject. In 1853, Sir B. Martin, writing in the *Lancet* (Vol. II., p. 53), called the attention of the profession to it; finally, in 1868, it was made official in the Pharmacopœia of India, where it is recommended as a remedy of much value in atonic diarrhœa and dysentery and in the advanced stages of those diseases, in irregularity of the bowels, and in habitual constipation. In the Concan the small unripe fruit (Bál belphal) is given with fennel seeds and ginger in decoction for piles; a compound pill containing two parts each of Bál belphal, Mimusops elengi fruit, and galls, one part each of nutmeg, cloves, saffron, nágkesar and mace, is used as a remedy for diarrhœa; the dose is one pill for a child and three for an adult. Two tolás of the juice of the bark is given with a little cummin in milk as a remedy for poverty of the seminal fluid.

Description.—The fruit is a large berry, 2—4 inches in diameter, variable in shape, being spherical or somewhat flattened like an orange, ovoid, or pyriform, having a smooth hard shell; the interior divided into 10—15 cells, each containing from 6—10 woolly seeds, consists of a mucilaginous pulp, which is very aromatic, each seed is surrounded by a clear tenacious mucus. The commercial article is entire or in dried slices, having on the outer side a smooth greyish brown shell, enclosing a hard orange brown gummy pulp, in which the cells and seeds may be seen; the latter are oblong and compressed, about 3 lines long, and covered with whitish hairs; the dried pulp has a mucilaginous, acid, and slightly astringent taste, and a very agreeable aroma, resembling that of elemi.

Microscopic structure.—The rind is covered with a grey cuticle or bloom, and further shows two layers, the one exhibiting not very numerous oil cells, and the other and inner made up of sclerenchyme. The tissue of the pulp consists of large cells. In the epidermis of the seeds certain groups of cells are excessively lengthened and constitute the woolly hairs already noticed.

Chemical composition.—As stated in the Pharmacographia, the dry pulp moistened with cold water yields a red liquid containing chiefly mucilage and (probably) pectin, which separates if the liquid is concentrated by evaporation. The mucilage may be precipitated by neutral acetate of lead or by alcohol, but is not coloured by iodine. It may be separated by a filter into a portion truly soluble (as proved by the addition of alcohol or acetate of lead) and another, comprehending the larger bulk, which is only swollen like Tragacanth, but is far more glutinous and completely transparent. Neither a per nor a proto salt of iron shows the infusion to contain any appreciable quantity of tannin. Warden remarks that the ripe and unripe fruit, when moistened with a solution of ferric chloride gives a marked tannic acid reaction, strongest in those portions of the pulp next the rind, the clear mucilage surrounding the seeds he found to have an acid reaction, and to contain lime.

Commerce.—Value, dry fruit, ¾ to Re. 1 per 100; green fruit 6 as. per 100; dry pulp, Rs. 20 per cwt. The Bombay market is chiefly supplied from the Deccan. The fruits are usually small and not suitable for the preparation of the conserve; for this purpose the large cultivated fruit of Bengal should be obtained in a fresh condition. Season—November and December.

Feronia elephantum, *Corr., Roxb. Cor. Pl., t.* 141; *Wight Ic., t.* 15. The leaves, fruit and gum.

Vernacular.—Kowit, Kavitha (*Hind.* and *Bomb.*), Kathbel (*Beng.*), Vilam-pazham (*Tam.*)

History, Uses, &c.—The woodapple, in Sanskrit Kapitta, is met with throughout India, and is cultivated for the sake of the fruit, which is edible. The Hindus consider the unripe fruit to be a useful astringent in diarrhœa and dysentery, and prescribe the ripe fruit in affections of the gums and throat. The leaves are aromatic and carminative, and have an odour of anise. The author of the Makhzan-el-Adwiya says that the leaves are very astringent, and have the taste and odour of Tarragon. He describes the fruit as cold and dry in the second degree, refreshing, astringent, cardiacal and tonic, a useful remedy in salivation and sore thoat, strengthening the gums and acting as an astringent; sherbet made from the fruit increases the appetite, and has alexipharmic properties. The pulp applied externally is a remedy for the bites of venomous insects; if not obtainable, the powdered rind may be used. Ainslie mentions the use of the fruit, leaves, and gum. He says that the latter supplies the place of gum Arabic in Lower India, and is prescribed by

Tamool practitioners to relieve tenesmus in bowel affections. The Feronia elephantum is the Balong of the Portuguese. It is mentioned in the Bengal Dispensatory and Pharmacopœia of India, but no further information as to its properties is to be gathered from these works. In Bombay the fruit is cultivated, and attains a diameter of four inches. The gum forms part of the country gum which is sold in the bazaars. The country people pound the leaves with curds and apply the mixture to the whole body as a remedy for heat of blood supposed to be caused by bile.

Description.—The ordinary woodapple is globose, one-celled, about 2½ inches in diameter, covered with a scurfy epidermis, which is of a light grey or dirty white colour; beneath the epidermis the rind is dull green, woody and granular, much more fragile than that of the Bél. The pulp is of a pale greyish pink; in it are embedded numerous oblong, compressed seeds, having thick fleshy cotyledons, and a radicle pointing away from the hilum. The odour of the ripe cultivated fruit is aromatic and resembles that of a melon. The leaves have from 5—7 leaflets, cuneate, or obovate with a crenate tip; they smell like anise. The gum is in tears or irregular masses, yellow or brownish; dissolved in water it forms an almost tasteless mucilage, much more viscid than that of gum Arabic made in the same proportions. The solution reddens litmus, and is precipitated by alcohol, oxalate of ammonia, alkaline silicates, perchloride of iron, but not by borax. Moreover, the solution is precipitated by neutral acetate of lead or caustic baryta, but not by potash. If the solution is completely precipitated by neutral acetate of lead, the residual liquid will be found to contain a small quantity of a different gum, identical apparently with gum Arabic, inasmuch as it is not thrown down by acetate of lead. If the lime is precipitated from the Feronia mucilage by oxalate of potassium, the gum partially loses its solubility and forms a turbid liquid.

Chemical composition.—The larger portion of Feronia gum is not identical with gum Arabic; when examined in a column of 50 mm. length it deviates the ray of polarised light 0°·4 to the right;—not to the left, as gum Arabic. Gum Arabic may be combined with oxide of lead; the compound (arabate of lead) contains 30·6 per cent. of oxide of lead, whereas the plumbic compound of Feronia gum dried at 110° C. yields only 14·76 per cent. of Pb. O. The formula $2\,(C^{12}\,H^{21}\,O^{11})\,Pb.+2\,(C^{12}\,H^{22}\,O^{11})$ supposes 15 per cent. of oxide of lead.

Feronia gum repeatedly treated with fuming nitric acid, produces abundant crystals of mucic acid. Dried at 110° C. it yields about 17 per cent. of water. The ash amounts to about 3·55 per cent. (Pharmacographia, p. 212.) No chemical examination of fruit or leaves appears to have been made.

Commerce.—The gum, or rather the mixed gums of which Feronia gum forms a part, is known as Ghatí gum, and is worth about Rs. 16 per cwt. in Bombay.

SIMARUBEÆ.

Ailantus excelsa, *Roxb., Cor. Pl., t.* 23; *Wight Ill. i., t.* 67. The bark and leaves.

Vernacular.—Mábárukh (*Bomb.*), Perumaruttoo-puttay (*Tam.*)

History, Uses, &c.—I have not been able to find any notice of this tree in Hindu or Mahometan works on Materia Medica. Ainslie says that the bark has a pleasant and somewhat aromatic taste, and is prescribed by the native practitioners in infusion in dyspeptic complaints to the extent of three ounces twice daily. Dr. Wight mentions that in the Circars the bark is regarded as a powerful febrifuge, and as a tonic in cases of debility. Ainslie's description of the bark as pleasant tasted and somewhat aromatic is hardly correct. I have found it intensely bitter like quassia. In Bombay the bark and leaves are in great repute as a tonic, especially in debility after child-birth. In the Concan the juice of the leaves is usually administered in *Khîr*, or the juice of the fresh bark is given with Cocoanut juice and treacle, or with aromatics and honey; it is said to stop after-pains.

Description.—Bark light coloured, very thick and granular, externally hoary, rough from the presence of numerous longitudinal scabrous ridges; internal surface yellowish white and finely fibrous; when soaked in water it swells greatly, and becomes glutinous on the surface; odour when moist acrid and disagreeable; taste very bitter. The leaves are abruptly pinnated, tomentose when young, afterwards glabrous, leaflets 10—14 pair, 4—5 inches long, coarsely toothed at the base; taste bitter and somewhat aromatic.

Microscopic structure.—Sections for the microscope show that a great portion of the bark consists of large stony cells collected together in groups. There are also many conglomerate raphides.

Chemical composition.—No complete examination has been made. Mr. N. Dají separated an acid principle which he named Ailantic acid. It is reddish brown, very bitter, and forms a deliquescent mass of waxy consistence, very easily soluble in water, less in alcohol and ether, and insoluble in chloroform and benzol,

Ailantus malabarica, *D. C., Rheede Hort. Mal. vi., t.* 15. Grows in Canara, where the resin is known as Bága-dhup. The bark has a pleasant and slightly bitter taste, and is given in cases of dyspepsia, and is also considered a valuable tonic and febrifuge. It yields a fragrant resin known as "Mutteepal" on the Annamallays, which may become valuable as an article of trade. Reduced to powder, mixed with milk and strained this resin is given in small doses in dysentery and also in bronchitis, and is reputed to be an excellent remedy, chiefly owing to its balsamic properties. The fruit, triturated with mango, and mixed with rice, is reckoned useful in cases of ophthalmia, and the juice of the fresh bark in 1 oz. doses with an equal quantity of curds is said to be a valuable remedy in dysentery. Wight states that the bark is rough and very thick, and studded with bright garnet-looking grains, apparently of a resinous nature, which do not dissolve in either alcohol or water. Mr. Broughton, the Government Quinologist, reported upon this resin as follows:—"The resin, as commonly met with, is dark brown or grey in colour, is plastic, opaque, and has an agreeable smell. It contains much impurity. The pure resin is very soft, having the consistence of thick treacle; and this is doubtless the reason why it is always mixed with fragments of wood and earth, which make it more easy to handle. The sample which I examined contained but 77 per cent. of resin, the remainder being adulterations. Alcohol readily dissolves the resin, and on evaporation, leaves it as a very viscous, transparent, light brown semi-liquid, which does not solidify by many days' exposure to a steam heat; when burnt, it gives out a fragrance, and hence it is sometimes used for incense. The perfume is, however, inferior to that produced by many other resins employed in the concoction of the incense employed in Christian and heathen worship. The peculiar consistency of the resin would enable it to be used as a substitute for Venice turpentine for many purposes, though its price (Rs. 6 for 25 lbs. in the crude state) forbids an extensive employment."

Balanites Roxburghii, *Planch.*, *Wight. Ic.*, *t.* 274. The fruit.

Vernacular.—Hingan, Hinganbet (*Hind.* and *Bomb.*), Nanjundan (*Tam.*)

History, Uses, &c.—The B. Roxburghii is a thorny shrub growing in dry, barren places in India, Egypt and the West Coast of Africa. It has binate leaves and oval leaflets. The flowers are small, greenish-white and fragrant, arranged in axillary racemes. The fruit is oval, about 1½ inch long, and yellow when ripe, having much the appearance of a lime. The bark, unripe fruit, and leaves are pungent, bitter and purgative, and are considered to have anthelmintic properties. The ripe fruit has a yellow soapy pulp, sweet, but of disagreeable flavour, nevertheless it is eaten in Egypt, and when fermented yields an intoxicating liquor used by the African negroes.* According to A. A. Black, an oil, called by the negroes 'zachun,' is obtained from the seeds. In India the immature fruit is to be found in the druggists' shops; it is used as a purgative and anthelmintic, the dose being half a seed; in smaller doses of 2 to 20 grains it is expectorant. The ripe nut, when bored and emptied of its contents, is filled with powder and converted into a small bomb, which explodes with a loud noise. The bark, unripe fruit, and leaves are given to cattle as an anthelmintic. Baillon says that in Egypt the ripe fruit is called Desert date, and the unripe Egyptian myrabolan. The African Arabs call the tree 'El Heglyg,' and use the pulp of the fruit as a detergent and the bark to poison fish.

Description.—The fruit is a drupe, with smooth, fragile epicarp, and fleshy, oily mesocarp traversed by bundles of vascular fibres, with a pentagonal, hard, bony, monospermous stone. The descending seed contains under its coats a thick exalbuminous embryo, with plano-convex cotyledons, sometimes unequal, bilobed or corrugate, and a short superior radicle. (Baillon.) As found in the shops, the fruit presents a wrinkled appearance, and is of a greenish yellow colour, having been gathered while immature.

Samadera indica, *Gärtn. Fruct. ii., t.* 156; *Wight Ill., t.* 68; *Rheede Hort. Mal. vi., t.* 18.

Vernacular.—Samadara (*Cingh.*), Karinghota (*Mal.*)

Description, Uses, &c.—A tree 30 to 35 feet high, of the Western Peninsula, South Concan and Malabar; also met with in Ceylon. It has large, alternate, oblong leaves, and long axillary or terminal peduncles, divided at the top into a small umbel which becomes pendulous in fruit, the latter is oval, 1½ by 1 inch, and is a dry compressed one-seeded drupe, with a narrow unilateral wing; its surface is coriaceous, smooth, or slightly reticulated, and of a brown colour. The seed is brown and curved. The bark of the tree is reddish-brown, smooth, internally whitish dotted, and has a short finely fibrous fracture; both it and the seeds are very bitter, and the former is used as a febrifuge on the Malabar Coast. The natives also extract an oil from the kernels which is said to be a good application in rheumatism. The bruised leaves are externally applied in erysipelas, and the seeds are worn round the neck as a preventive of asthma and chest affections. (Rheede, Watt.)

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* Mr. Delile considered this fruit to be the περσέα of the Greeks and the Lebakh of the Arabs. The author of the Makhzan says that the fruit when ripe is sweet but nasty. Persea is mentioned by Pliny as a sacred tree in Egypt and Persia. Plin. 13, 9; and 15. 13; see also Dios. i., 150. The seeds of Balanites have been found along with other fruit seeds in the Egyptian tombs.

Chemical composition.—De Vrij (1872) expressed from the seeds 33 per cent. of a light-yellow bitter oil, which contains, according to Oudemans, 84 per cent. of olein and 16 per cent. of palmitin and stearin. The bitter principle, *samaderin*, was yellowish, and soluble in water and alcohol and amorphous; Tonningen (1858) had obtained it from the seed and bark in white scales, which became yellow with nitric or hydrochloric acid, and violet red with sulphuric acid.

BURSERACEÆ.

Boswellia.—Several species inhabiting Eastern Africa, near Cape Guardafui and the Southern Coast of Arabia. *Bentl. and Trim., t.* 58. The gum resin. Olibanum.

Vernacular.—Kundur, Lubán (*Arab.* and *Hind.*), Visesh, or Esesh (*Bomb.*), Parangí-shambiraní (*Tam.*)

History, Uses, &c.—For an account of the different species, Birdwood on the Genus Boswellia, with descriptions and figures of three new species [Linn. Trans. XXVII. (1871), 111,] may be consulted; also the Pharmacographia (p. 120), but the exact number of species cannot be determined until more perfect materials shall have been obtained. An interesting summary of the history of Olibanum in Europe will be found in the Pharmacographia. It is the θύος and λιβάνος of the Greeks and the Tus or Thus of the Romans.* In the East we know that the Arabs as early as the 10th century carried Olibanum to India and China. Sanskrit writers speak of it as Kundurú, and describe its use as an incense and as a local application to indolent swellings to promote suppuration. The Mahometan writers describe several kinds of Olibanum—1*st*, deep yellow tears, called Kundur Zakar, or Male Frankincense; 2*nd*, pale tears, called Kundur Unsa, or Female Frankincense; 3*rd*, Kundur Madahraj, artificial tears, made by shaking the moist exudation in a basket; 4*th*, Kishar Kundur or Kashfa, the bark or scurf of the tree coated with the exudation *(Dhup of Bombay market)*; 5*th*, Dukak Kundur, or dust of Olibanum. The first kind is most esteemed. Mír Mohammad Husain says that Frankincense should burn readily, showing that it is not mixed with gum Arabic; should not emit much smoke, showing its freedom from Juniper resin. Moreover, he remarks that a kind of Frankincense is said to be produced in India which has a reddish tinge (probably an allusion to Gúgul). Olibanum is considered by the Mahometans to be hot and dry, and to have dessicative, astringent and detergent properties. It is used internally and externally in much the same way as we use the products of the Pines and Firs. Recently Olibanum has been made official in the Pharmacopœia of India, where it is recommended in chronic pulmonary affections, such as bronchorrhœa and chronic laryngitis, employed both internally and in the form of fumigation. In the same work an ointment has been introduced which is said to be a good stimulant application to carbuncles, ulcerations, boils, &c. I have found that a good imitation of commercial Burgundy Pitch may be made by incorporating melted Olibanum with water in a steam bath; a sufficiently good quality for this purpose can be purchased for Rs. 12 per cwt. Bombay is the centre of the Olibanum trade. The houses which deal in gums have agents in Arabia and Africa, who buy it up and forward it here in a mixed condition. It passes through the Custom House as *Esesh*, and is next sorted into four or five different qualities. The first, consisting of all the large clean tears, is destined for the European market. The intermediate qualities and the last, which is only the dust and refuse, supply the Indian and China requirements. The Kishar Kundur or Kashfa of the Arabs forms a distinct article of commerce under the Indian name of *Dhup*. The method of collecting Olibanum in Africa has been described by Cruttenden (Trans. Bomb. Geograph. Soc. VII., 1846, 121). Carter in the same publication has described the collection of the drug in Southern Arabia. In both localities a simple incision in the tumid bark is made, and the product collected as soon as it becomes sufficiently hard. The collection is carried on from March to September in Africa, and from May to December in Arabia. The stalactitic form of Olibanum, called Lubán Meyeti, produced by B. Frereana, Birdw., is occasionally met with in the Bombay market under the name of *Pandhrí Esesh* or *Pandhrí Lubán*; it differs from ordinary Olibanum, inasmuch as it contains no gum soluble in water.

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* Confer. Theoph. Hist. Plant. iv., 7. Dios. i., 72. Plin. 12, 14. Lucr. 3, 328.

Description.—Olibanum as found in commerce varies considerably in quality and appearance. It may be described as a dry gum-resin, consisting of detached tears up to an inch in length, of globular, pear-shaped, clavate, or stalactitic form, mixed with more or less irregular lumps of the same size. Some of the longer tears are slightly agglutinated, but most are distinct. The predominant forms are rounded,—angular fragments being less frequent, though the tears are not seldom fissured. Small pieces of the translucent brown papery bark are often found adhering to the flat pieces. The colour of the drug is pale yellowish or brownish, but the finer qualities consist of tears which are nearly colourless or have a greenish hue. The smallest grains only are transparent, the rest are translucent and somewhat milky and not transparent even after removal of the white dust with which they are always covered. but if heated to about 94° C., they become almost transparent. When broken they exhibit a rather dull and waxy surface, Examined under the polarizing microscope, no trace of crystallization is observable. Olibanum softens in the mouth; its taste is terebinthinous and slightly bitter, but by no means disagreeable. Its odour is pleasantly aromatic, but is only fully developed when the gum resin is exposed to an elevated temperature. At 100° C. the latter softens without actually fusing, and if the heat be further raised decomposition begins. (Pharmacographia, p. 123.)

Chemical composition.—Flückiger and Hanbury observe that cold water quickly changes Olibanum into a soft whitish pulp, which when rubbed down in a mortar forms an emulsion. Immersed in spirit of wine, a tear of Olibanum is not altered much in form, but it becomes of an almost pure opaque white. In the first case the water dissolves the gum, while in the second the alcohol removes the resin. They find that pure Olibanum treated with spirit of wine leaves 27—35 % of gum, the solution of which is precipitated by perchloride of iron as well as by silicate of sodium, but not by neutral acetate of lead. It is consequently a gum of the same class as gum Arabic, if not identical with it. Its solution contains the same amount of lime as gum Arabic affords. The resin of Olibanum has been examined by Hlasiwetz (1867), according to whom it is a uniform substance having the composition $C^{20} H^{30} O^{3}$. Flückiger and Hanbury find that it is not soluble in alkalis, nor have they succeeded in converting it into a crystalline body by the action of dilute alcohol. It is not uniformly distributed throughout the tears; if they are broken after having been acted upon by dilute alcohol, it now and then happens that a clear stratification is perceptible, showing a concentric arrangement. Olibanum contains from 5—7 % of essential oil. According to Stenhouse it has a sp. gr. of 0·866, a boiling point of 179·4 C., and an odour resembling that of turpentine but more agreeable. Kurbatow separated this oil into two portions, the one of which has the formula $C^{10} H^{16}$, boils at 158° C., and combines with H. Cl. to form artificial camphor; the other contains oxygen. (Pharmacographia, p. 124.)

Commerce.—Olibanum is shipped from Makulla, Aden, and other neighbouring ports to Bombay; as already mentioned, it is there sorted for the different markets. The trade is in the hands of Khojas and Bunnias. The price varies from Rs. 4 per cwt. for the dust to Rs. 20 per cwt. for the finest tears. Bombay exports from 25,000 to 30,000 cwts. annually. Nearly four-fifths of this quantity go to Europe, and the rest to China.

Boswellia serrata, *Roxb. ex Colebr. in Asiat. Res. IX.,* 379. *t.* 5. The gum resin.

Vernacular.—Salai, Gúgal (*Hind.* and *Bomb.*), Kundurukampishin (*Tam.*)

History, Uses, &c.—The history of this drug is involved in hopeless obscurity, owing to its having been confounded by both native and European writers with true Frankincense and Bdellium. Sanskrit writers may possibly sometimes allude to it when they speak of Kunduru, but as this word is evidently the same as the Arabic Kundur, it is just as likely that they allude to the true Frankincense imported from Africa and Arabia, and which we may suppose to have been introduced into India at a very remote period. Mahometan writers have probably included the produce of B. serrata among the different kinds of Mukul for which they give as the Indian synonym Gúgul. It seems probable that the true Sanskrit name for B. serrata is Salaki, from which the Hindí word Salai has been derived. Ainslie notices B. glabra as producing Gúgul, and B. serrata the Olibanum of commerce, but calls the latter *Salai,* and quotes Dr. F. Hamilton's MS. account of Shahabad, where the tree is said to be very common and to yield a resin called *Sale-gond or Sale-lassa, which is not used.* Dr. Hamilton describes it as of the consistence of turpentine when it flows from the tree; in this state it is called at Chandalgar Gandah-biroza, and in the dry state Sukha-biroza. (Mat. Ind. 1, 226.) Other European authors make the same mistake with regard to the source of commercial Olibanum. B. glabra is now considered to be only a variety of B. serrata. In Bombay the term Gúgul is loosely applied to the gum-resin of B. serrata and to that of the Indian Balsamodendrons, but when speaking more particularly the dealers distinguish the latter as Mhaisa-gúgal. B. serrata is one of the commonest trees in some parts of Khandesh, Loonawara, and other neighbouring territories; the gum-resin is obtained by incising the bark. Dr. Hooker, when ascending from Belcuppee in Behar to the height of 1,360 feet, came upon a small forest of these trees, which he likens to the mountain ash. Dr. Irvine remarks that the tree is very plentiful in the Ajmeer hills, where the gum resin is called Ganda biroza, and is similar in appearance to Venice turpentine. Dr. O'Shaughnessy obtained fine specimens from the Shahabad country. It would appear to be the Guggulu of Sanskrit writers, which they describe as moist, viscid, fragrant, and of a golden colour when freshly exuded—a description which is not applicable to the exudation of the Balsamodendrons, but is exactly so to the exudation of B. serrata. Guggulu is said to be demulcent, aperient, alterative, and a purifier of the blood. It is used in rheumatism, nervous diseases, scrofulous affections, urinary disorders and skin diseases, and is generally combined with aromatics.

Description.—The fresh exudation is of the colour and consistence of Canada Balsam; it hardens very slowly, retaining its golden colour and transparency. The odour is that of Olibanum, but fainter and more terebinthinate; cold water converts it into a soft whitish pulp, which, when rubbed in a mortar, forms an emulsion. Spirit also makes it white and opaque by dissolving the resin. In short, it has the characters of Olibanum, but does not harden like that article. It burns readily, and diffuses an agreeable odour.

Commerce.—Gúgal can hardly be called an article of commerce in Bombay. It would appear that the greater part of what is collected in this Presidency is consumed in Central and Northern India. The abundance and cheapness of imported Olibanum prevents any demand for it here.

Balsamodendron sp., *Bentl. and Trim.*, *t.* 60. Myrrh.

Vernacular.—Bol (*Hind.* and *Bom.*), Vellaip-polam (*Tam.*)

History, Uses, &c.—Myrrh is not much used by the Hindus. It is called Vola in Sanskrit, and is described as useful in fever, epilepsy, and uterine affections. The similarity of its properties to those of Mhaisa-gúgal, which is an article of importance in Hindu medicine, probably accounts for its not having greatly attracted the attention of the Hindus upon its introduction into India from the West. The Greeks and Romans used it to flavour their wine; they also anointed their hair with a perfumed unguent made from it: "lautissima apud priscos vina erant, myrrhæ odore condita." Plin. 14, 13; "crines myrrha madidi," Ovid. M. 10. 298, *et seq.* It is the σμυρνα of Dioscorides, I., 69. With the Mahometans Myrrh is an important article of the Materia Medica. They describe the tree which produces it as tall and handsome, with knotted branches, a native of Socotra and neighbouring countries, and say that spears are made of the branches, which are solid and free from pith; that the juice when it first exudes is white and milky, and that the best Myrrh is obtained by making incisions in the tree. What exudes of itself is called Batáreh.* After the trees have been wounded, mats and vessels are placed to catch the juice. According to Mir Mohammad Husain the best Myrrh should be of a reddish yellow colour, and the surface covered with a pale dust. When broken it should show white marks like those at the root of the finger nail. The same authority says that Myrrh is hot and dry; detergent, siccative, astringent and aperient, a disperser of cold tumours, and one of the most important of medicines, as it preserves the humours from corruption. It is much used externally as a stimulant and disinfectant application to ulcers, sores, &c., &c. Dissolved in women's or asses' milk it is dropped into the eye in purulent ophthalmia. As an internal remedy it is given in coughs, in atonic dyspepsia, diarrhœa, amenorrhœa, worms, &c. It is also thought to keep away fever, and prevent the hair falling off. Administered by means of fumigation it is said to have the same effect as when taken in the ordinary way. The leaves, fruit, and wood are said to partake of the same properties as the gum-resin. The history of the use of Myrrh in Europe goes back to a very early date. A good summary will be found in the Pharmacographia (p. 125). Bombay is the centre of the Myrrh trade. The merchants who deal in the gums which come from the north-east of Africa and Southern Arabia, have their chief houses here, and employ partners or agents at Aden and Makalla; the Aden agents also attend the great annual fair at Berbera on the opposite coast, and exchange English and Indian goods for Myrrh, Bdellium and other African produce. The bags or bales which contain the Myrrh, when opened in Bombay, are found to be made up of—1*st*, a large proportion of roundish masses of fine Myrrh; 2*nd*, a considerable proportion of small semi-transparent pieces of Myrrh of irregular shape; 3*rd*, numerous pieces of dark-coloured Myrrh, mixed with bark and other refuse; 4*th*, a small proportion of an opaque gum-resin (Bdellium opaque of Guibourt), occasionally pieces of resin (juniper ?) are also met with. In Bombay the contents of the package are sorted; the best Myrrh goes to Europe; the darker pieces form a second quality, and the refuse is exported to China, where it is said to be used as an incense. True Myrrh is known in the Bombay market as Karam or Bandar Karam.* From Makalla and Aden another kind of Myrrh is received, Arabian Myrrh. The trade name of this drug in Bombay is Meetiya; it is mostly sold in India as true Myrrh, for which it might easily be mistaken by any one not specially acquainted with drugs. The dealers here say that no true Myrrh is ever received from Arabia. A drug called Meetiya or Chinaíbol is also imported from Siam; it is used in Calcutta and Bombay instead of true Myrrh, and can hardly be distinguished from Arabian Meetiya. Persian Myrrh has only recently made its appearance in the Bombay market; it occurs in very large masses of a rich reddish brown colour and considerable translucency; very oily; in taste and odour it resembles African Myrrh very closely. Pieces of papery bark are found adhering to it. It comes principally from Mekran, and is probably the Myrrh mentioned by Arrian as having been found by Alexander's army in the country of the Γαδρωσοί. It readily forms an emulsion with water, and appears to have all the properties of commercial Myrrh.* The botany of the Myrrh trees is still encompassed with uncertainty, which cannot be removed until the very localities in which the drug is collected shall have been explored by a competent observer. At present all we can say is that it is probable that Ehrenberg's or Carter's Balsamodendron produces the Arabian Myrrh, and that a much larger species growing in north-eastern Africa produces the true Myrrh of commerce; of the source of the Persian Myrrh we know nothing as yet.

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* مر البطارح

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* A seaport on the African coast nearly opposite Aden.

Description.—Myrrh consists of irregular roundish masses, varying in size from small grains up to pieces as large as an egg, and occasionally much larger. They are of an opaque reddish brown, with dusty dull surface. When broken they exhibit a rough or waxy fracture, having a moist and unctuous appearance, especially when pressed, and a rich brown hue. The fractured translucent surface often displays characteristic whitish marks which the ancients compared to the light marks at the base of the finger nails. Myrrh has a peculiar and agreeable fragrance, with an aromatic bitter and acrid taste. Water disintegrates it, forming a light brown emulsion which, viewed under the microscope, appears made up of colourless drops, among which are granules of yellow resin. Alcohol dissolves the resin of Myrrh, leaving angular non-crystalline particles of gum and fragments of bark. (Pharmacographia, p. 127.)

Chemical composition.—Flückiger and Hanbury say:—"The gum which is dissolved when Myrrh is treated with water amounts to between 40 to 50 per cent. It is partially precipitable by neutral acetate of lead, showing that it differs from gum Arabic; but a portion (about one-fourth) agrees with the latter in respect to its action on acetate of lead. The resin dissolves completely in chloroform or alcohol, and the colour of the latter solution is but slightly darkened by perchloride of iron.* It is but partially soluble in alkalis or in bisulphide of carbon. Brückner (1867) found this portion to yield 75·6 per cent. of carbon and 9·5 of hydrogen. The resin which the bisulphide refuses to dissolve is freely soluble in ether. It contains only 57·4 per cent. of carbon. The resin of Myrrh to which when moistened with alcohol a small quantity of hydrochloric acid is added, assumes a violet hue, but far less brilliant than that displayed by resin of Galbanum when treated in a similar manner. Myrrh yields on distillation a volatile oil, which in operating on 25 lbs. of the drug, we obtained to the extent of $\frac{3}{4}$ per cent.† It is a yellowish, rather viscid liquid, neutral to litmus, having a powerful odour of Myrrh and sp. gr. 0·988 at 13° C. In a column 50 mm. long, it deviates a ray of light 30·1° to the left. By submitting it to distillation, we obtained before the oil boiled, a few drops of strongly acid liquid having the smell of formic acid. Neutralized with ammonia, this liquid produced in solution of mercurous nitrate a whitish precipitate, which speedily darkened, thus indicating formic acid, which is developed in the oil. Old Myrrh is in fact said to yield an acid distillate. The oil begins to boil at about 266° C., and chiefly distils over between 270° and 290°.

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* In 1882 the imports of Persian Myrrh rose to 1,000 cwts.

"On combustion in the usual way it afforded carbon 84·70, hydrogen 9·98. Having been again rectified in a current of dry carbonic acid, it had a boiling point of 262 to 263° C., and now afforded carbon 84·70, hydrogen 10·26, which would nearly answer to the formula $C^{22} H^{32} O$. The results of Ruickhold's Analysis (1845) of essential oil of Myrrh assign it the formula $C^{10} H^{14} O$, which is the same as that of carvol and thymol, and widely different from that indicated by our experiments. The oil which we rectified displays a faintly greenish hue; it is miscible in every proportion with bisulphide of carbon, the solution exhibiting at first no peculiar colouration when a drop of nitric or sulphuric acid is added. Yet the mixture to which nitric acid (1·20) has been added, assumes after an hour or two a fine violet hue, which is very persistent, enduring even if the liquid is allowed to dry up in a large capsule. If to the crude oil dissolved in bisulphide of carbon bromine be added, a violet hue is produced, and if the solution is allowed to evaporate, and the residue diluted with spirit of wine, it assumes a fine blue, which disappears on addition of an alkali. The oil is not altered by boiling with alcoholic potash, nor does it combine with alkaline bisulphites.

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* The proportion of resin in Myrrh is variable, Flückiger has found the finest samples to yield as much as 27 per cent.

† Distilled on a large scale good Myrrh yields as much as 4·4 per cent.

"The bitter principle of Myrrh is contained in the resin as extracted by alcohol. By exhausting the resin with warm water an acid brown solution is obtained, from which a dark, viscid, neutral mass separates if the liquid is concentrated; it is contaminated with a large amount of inorganic matter, from which it may be purified by means of ether. Yet the latter affords also but an amorphous, somewhat brittle brown substance, softening at 80°—90° C. This bitter principle is but sparingly soluble in water, and the yellowish solution is intensely bitter. The bitter principle of Myrrh appears to be a glucoside."

Commerce.—The sources of supply have been already noticed. Value, Bander Karam, Rs. 34 per maund of 37½ lbs.; Meetiya, Rs. 16 to 25 per maund; refuse, Rs. 8 per maund.

Other allied Gum Resins.—From Berbera also comes *Bdellium* (*Vern.* Mhaisábol,[*] *vulg.* Bysabol). In the bales of this drug two distinct kinds are met with, *viz.*, ordinary Bdellium, which to a certain extent resembles Myrrh, but is of a darker colour, less oily, and has a peculiar odour destitute of the aroma of Myrrh, and a perfumed kind called by the Arabs *Habak-Hadee*, which occurs in irregular-shaped pieces more or less flat, some of them having earth and fragments of thick bark adhering; it is of a dark reddish brown colour, but opaque yellowish white streaks run through the semi-transparent reddish mass. The odour is more powerful and more perfumed than that of common Bdellium; the taste perfumed, aromatic, and feebly bitter, whereas common Bdellium is strongly bitter and has hardly any aroma. *Indian Bdellium* (*Mhaisagúgal*), *the produce of B. mukul*, somewhat resembles the African drug in general appearance, the pieces often having portions of papery bark attached to them, but the colour is lighter, often greenish; the odour and taste are somewhat different, and a certain proportion of it is in distinct vermiform pieces as thick as the little finger. Its value is one-third less than that of African Bdellium. *Opaque Bdellium* is found in small quantities in the packages of Myrrh and other gums which come from Africa. It is known in Bombay as *Meenaharma*, and is of a yellowish white colour; and quite opaque like ammoniacum; it has hardly any odour, but a very bitter taste. The native practitioners use it to facilitate the extraction of Guinea-worms; it would appear to poison the animal, as it makes it loosen its hold upon the tissues. *Indian Bdellium* (*Mhaisagúgal*), *the produce of B. Roxburghii*, occurs in irregular lumps, covered more or less with dirt and hair, to which portions of papery bark as well as the thick inner bark sometimes adhere; it is of a greenish yellow colour, with an occasional tinge of red; consistence waxy, soft, and brittle; odour peculiar and balsamic, something like cedar-wood; taste bitter. With water it forms a greyish-white emulsion; when inflamed it swells and sputters instead of burning with a clear flame like the Gúgal of Boswellia serrata. I have been favoured by Mr. Woodrow, of the Hewra Botanical Gardens, with fresh specimens of the stem and exudation of B. Roxburghii collected near Peit, about 30 miles north of Poona, where the tree has been planted to form a hedge round a Hindu temple.

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[*] Buffalo Myrrh, because it is given to these animals to increase the flow of milk.

Dioscorides (i., 71,) mentions three kinds of *βδελλίον*. Indian Bdellium, he says, is dirty and dark-coloured, and is called *ἁδρό’βωλον*, i.e., *sticky bol.* Arabian Bdellium is described as dry, resinous and blueish or greenish black. His third kind is probably a kind of Myrrh, and must have been the kind alluded to by Plautus, who uses it as a term of endearment. "Tu crocinum et casia es, tu bdellium."

Description.—The epidermis consists of several rows of delicate elongated cells, containing a little granular matter; the cells beneath this, which form the green bark, are loaded with chlorophyll and starch. Proceeding inwards the chlorophyll gradually diminishes, and a few bundles of liber cells are met with, forming a broken irregular zone. Within this the cells contain granular matter, starch, and globules of balsam; balsam ducts permeate the bark at intervals, and the medullary rays are distinctly traceable; a few conglomerate raphides are met with. The wood, which is white, soft and brittle, consists of elongated thin walled cells divided into zones; in the zone next the bark the cells (18 to 20 rows) are empty, or contain a little starch; in the next they are smaller and loaded with large starch granules. The same kind of structure is continued to the central pith, which consists of cells of starch. The exudation of this tree as cultivated near Poona is at first opaque and milky; as it dries it becomes greenish and translucent, and very closely resembles the gum-resin sent to me from Sind as the produce of B. mukul in odour and taste. In consistence it differs from the commercial article, being a thick sticky fluid, but this may be due to its being produced in a climate unsuitable to the proper concoction of the balsam. Mahometan writers describe the different kinds of Bdellium under the name of Mukul, and say that it is the produce of a large tree common in Arabia and the neighbouring countries, and also in India. They distinguish several kinds, all of which are bitter. That having a reddish tinge they call Mukul-i-azrak; the yellowish, Mukul-i-yahud; the brown, Sakalabi; and the rich reddish brown, Mukul-i-Arabi. Good Bdellium should be clean, bright, sticky, soft, sweet-smelling, yellowish, and bitter; when burnt it smells like Bay; it mixes readily with water, and is described as hot and dry; from the account of its properties in the Makhzan-el-Adwiya, it would appear to be used in very nearly the same way as Myrrh. The cheaper kinds of Bdellium are largely used to give adhesiveness and polish to the fine plaster used by masons upon the ceilings and pillars of houses; for this purpose it is dissolved, strained, and mixed with molasses. Indian Bdellium combined with Black pepper and Colchicum has a reputation in muscular rheumatism; it is given internally, and also applied to the painful part as a *lép*.

Chemical composition.—Flückiger remarks that Mhaisabol differs from Myrrh in its stronger, almost acrid taste and in odour; it contains very little resin; this resin is different from that of Myrrh, being paler and redder; it is very sparingly soluble in bisulphide of carbon; this solution is not altered by bromine, whilst that of true Myrrh resin assumes a most intense violet colour; it is not soluble in petroleum ether. Of the gummy substance, which is by far the prevailing constituent of this drug, a small portion only is soluble in water. Parker has examined opaque Bdellium with the following result:—"*Opaque Bdellium* (*Balsamodendron Playfairii*) is a very hard, yellow ochre-coloured, opaque gum-resin, with but slight odour and a bitter taste. In common with other exudations from the genera *Balsamodendron* and *Boswellia,* tears of this substance frequently have portions of papery bark attached to their surface. Triturated with water, opaque bdellium forms a very good cream-coloured emulsion. Cold absolute alcohol dissolves about 50 per cent.; the residue is not entirely soluble in water, the insoluble portion swelling up and giving the characters of bassorin.

"The colouring matter appears to be due to a resin very soluble in alcohol, giving a canary yellow-coloured tincture; this resin is also soluble in ether, benzol and chloroform. The tincture (1 of gum-resin to 6 of rectified spirit) becomes slightly milky with alcoholic solution of plumbic acetate, gives a slight yellow precipitate with one drop of liq. plumbi subacet., and an intense greenish-black colour with tinct. ferri perchlor. The tincture is bitter and becomes milky with water.

"The mucilage made by dissolving 1 part of the gum (completely washed with rectified spirit) in 40 of water, is tasteless, partly precipitated by subacetate of lead and not at all by neutral acetate.

"The ash (1·6 per cent.) appears to be chiefly calcic carbonate dissolving entirely with effervescence in dilute acetic acid, and giving a copious precipitate with ammonium oxalate.

"Water distilled from opaque bdellium had the slight odour of the drug, but there was no appearance of oil globules in working on a small scale.

“Composition of opaque bdellium—

Soluble in alcohol (by difference)	47·42
Gum soluble in water	30·01
Gum insoluble in water	11·07
Moisture	11·50
	100·00”

—*Pharm. Journ., July 17th,* 1880.

Commerce.—The source of African Bdellium has already been noticed.* Bombay is supplied with Indian Bdellium from Cutch and Sind. Value, African, Rs. 8 per maund of 37½lbs.; Indian, Rs. 3⅝ to Rs. 4 per maund.

B. pubescens (Bayee of the hill Beloochees) yields a small quantity of a tasteless, inodorous, brittle gum almost entirely soluble in water, which is not an article of commerce, confer. Stocks in Phar. Journal (i.), Vol. IX., p. 275), where figures of B. mukul and B. pubescens will be found. Combined with sulphur, catechu and borax it has been recommended by Dr. J. Newton as a stimulating application to Delhi boils, to promote healthy granulation.

Hotai (*Somali*), Dukh (*Indian name in Muscat*), Dijj (*Arabic*). This is the name of a gum-resin produced by a small thorny tree which grows in the Somali country about Bunder Murrayah; the shrub is described as about six feet high, and not unlike the Myrrh. The gum-resin is used by the Somali women as a detersive for the hair. Dr. Jayakar of Muscat informs me that it is principally used by the Arabs in Oman for washing clothes: a small piece is tied in a rag and allowed to soak in the water for a few minutes, when it is placed in the clothes to be washed and well beaten with a piece of wood. It is also used for washing the body; for this purpose a piece is soaked in water and well stirred, so as to produce a froth like soapsuds upon the surface; the froth is then rubbed over the skin. Dijj is also an ingredient in a Hibar or plaster used in cases of local injuries, particularly those of the chest, also in rheumatic affections. Internally it is administered as an expectorant and as an ingredient of a suppository for piles.

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* The plant, which is now growing at Kew, and was brought home by Mr. Wykeham Perry as the Bysabol plant, and which was identified by Bentley and Trimen in ‘Medicinal Plants’ as Hemprichia erythrœa, has been identified by Professor Engler as the var. glabrescens of that plant.

The method of administering Dijj internally consists in taking a small piece of it, about half the size of an ordinary marble, and rolling it in a small piece of peeled lime fruit; it is then swallowed. This dose is given twice or thrice daily. (Jayakar.) According to the Arab lexicographers the name of this gum is ضجاج Dijaj or Dajjáj, and it is described under that name in the Makhzan-el-Adwiya as a gum like olibanum brought from the mountains of Oman, which is better than soap for washing clothes, as it makes them whiter; it is also said to be a useful application to wounds to remove proud flesh and promote healing; when made into a paste with honey it is applied to chronic rheumatic swellings of the limbs. (*Op. cit.*, article Dajjáj.) Vaughan sent a sample of Hotai from Aden to Hanbury, who gives the following description of it:—

"Irregular pieces 1½—1 inch in their longest diameter, frequently rounded on one side, as if portions of large tears, of entire smaller tears, and of irregular little fragments produced by the fracture of the masses. It is of wax-like opacity, cracked in all directions, and readily breaking up into angular pieces; on the exterior the larger pieces are yellowish-brown, or somewhat liver-coloured, and occasionally encrusted on one side with a reddish sand, upon which they appear to have fallen when in a soft state; internally the colours are generally paler or nearly white, sometimes darker towards the centre of the tear. The gum is nearly inodorous, but in taste is slightly bitter and acrid to the throat. A few fragments agitated with water in a phial speedily afford an emulsion, which remains frothy and milky for many days."

Bentley and Trimen consider that Hotai is the same as Opaque Bdellium, and is the produce of B. Playfairii, Hooker. f., but Parker (*Pharm. Jour.*, July 17th, 1880,) has pointed out that tincture of the latter gum-resin gives an intense greenish-black colour with tincture of perchloride of iron, whereas gum Hotai gives no such reaction.

Balsamodendrum Opobalsamum, *Kunth., Bent. & Trim.*, *t.* 59. The Balsam, wood and fruit.

Vernacular.—The balsam, Balasán (*Arab.*, *Pers.* and *Bomb.*); the fruit, Hab-el-Balasán (*Arab.* and *Bomb.*), Tukm-i-Balasán (*Pers.*); the wood, Úd-i-Balasán (*Pers.* and *Bomb.*)

History, Uses, &c.—This is the βαλσάμον of the Greeks, (Dios. i., 18,) and the Balsamum of the Romans (Plin. 13, 1). Dioscorides also notices the use of the fruit (*carpobalsamum*) and wood (*xylobalsamum*). Arabic and Persian writers describe the Balsam tree as having hoary leaves like rue, and say that it is affected by heat and cold, drought and moisture, like a human being. They affirm that it sprang from the blood of the slain in Mahomet's conflict with the tribe of Harb, and that the Prophet used the Balsam for the resuscitation of the dead. Antakia says that the Christians have a tradition to the effect that when the Holy Virgin Mary and our Lord fled to Matriya in Egypt, our Lord washed His clothes at a well, and from the waste water which ran upon the ground, the Balsam tree sprang up, that on this account the tree is held in great veneration by the Christians, who value the Balsam at its weight in gold. The wood is called Úd-i-balasán; it is heavy and red, with yellowish bark. Genuine Balasán when thrown into water sinks; cotton dipped in it can be washed quite clean in water; when rubbed upon a stick and inflamed it should burn without injuring the wood, like naptha. (*Vide* Makhzan-el-Adwiya, article Balasán.) Abd-el-Latif, who lived from 1161 to 1231, has described the extraction of the Balsam at the garden of Matriya near Cairo. He says that incisions are made with a sharp stone through the bark down to the wood, the juice is scraped from the tree by the fingers, and preserved in bottles which are buried in the earth for a time, and afterwards exposed to the sun until all the Balsam has separated from the impurities; it is then subjected to some secret process, after which it is stored in the king's treasury. The annual produce of the garden is about 20 ratls. (*Vide* Husn-el-muhá sarín fi akhbár Misr wa el Káhirah.) The Balsam is also extracted by boiling the leaves and wood in water.

Description.—Balsam of Mecca, when freshly imported into Bombay, is a greenish turbid fluid of syrupy consistence having a very grateful odour, something like oil of rosemary; when dropped into a vessel containing water it rises and forms a thin film upon the surface of the liquid, which after about a quarter of an hour can be raised entire by touching it with a pencil. When rubbed upon the palm of the hand for a few minutes, it loses its essential oil and becomes very sticky; dissolved in 6 parts of spirits 60 O. P. it forms a turbid greenish solution with many opaque flakes floating in it; these are soon deposited and adhere to the bottom of the bottle. The spirituous solution dropped on paper and placed in the sun rapidly evaporates leaving a slightly sticky varnish upon the surface of the paper. The Balsam itself dropped upon common scribbling paper spreads a little and soon becomes very thick; the paper beneath the drop becomes translucent only; after 12 hours it becomes so hard that when touched it no longer adheres to the finger.

Treated with 6 parts strong sulphuric acid B. P., the Balsam forms a rich red brown translucent solution of the colour and consistence of Stockholm tar, which upon being poured into water throws down a dull brown resinous deposit. Balsam of Mecca, which has been kept some time in the shops, becomes yellowish and more viscid; the essential oil would appear to be very volatile, as after a short exposure the Balsam does not render paper translucent, and has a simply terebinthinate odour. The taste is aromatic, bitter, and somewhat acrid. It would then appear that the Bombay balsam is very nearly of the same character as that described by Guibourt and supplied to him by M. Delessert, only that being fresher it differs in colour and contains more essential oil. (Confer. Hist. Nat. 6eme ed., Tom. III., 507.)

Chemical composition.—Trommsdorff found in a sample of this Balsam 30 °/° of volatile oil, 64 °/° of hard resin, 4 °/° of soft resin, and 0·4 °/° of bitter principles. The volatile oil was mobile, colourless, fragrant, and had a rough taste; it dissolved in alcohol and ether, and with a deep red colour in sulphuric acid, whence it was precipitated by water as a resin. It was also resinised by nitric acid. The hard resin was honey yellow, transparent, brittle, of specific gravity 1·333, softened at 44° C., and melted completely at 90° C. It dissolved with difficulty in alcohol and ether at ordinary temperatures, easily with aid of heat; it was likewise soluble in oils, both fixed and volatile. It was altered by hot nitric and sulphuric acids, and appeared to combine with alkalies, forming compounds insoluble in free alkali. The soft resin was brown and very glutinous, inodourous and tasteless; melted when dry at 112° C. It was insoluble in alcohol and ether, but soluble in oils, both fixed and volatile. It was not attacked by alkalies or by strong sulphuric acid; with nitric acid, it swelled up and became friable.

Hab-el-Balasán.—The fruit is imported from Arabia, and is kept by all the native druggists who deal in what are called here Mughlai medicines; it has a pleasant terebinthinate odour, and exactly corresponds with the figures and description of the fruits of B. opobalsamum in Bentley and Trimen's "Medicinal Plants." If soaked in water they soften and can be easily dissected, and the remarkable form of the pulpy layer within the epicarp be seen. Sections of the epicarp show very large ramifying balsam cells, which appear to communicate one with another. The fruit is considered to be a powerful carminative and digestive; it is also praised as a stimulant expectorant, and is usually administered in combination with tragacanth.

Commerce.—Balm of Mecca, Rs. 8 per lb.; the fruit, Re. ½ per lb.

Garuga pinnata, *Roxb., Cor. Pl. iii., t.* 208; *Rheede Hort. Mal. iv., t.* 33.

Vernacular.—Kúrak (*Bomb.*), Kúsimb (*Concan*).

The gum-resin of this tree is greenish yellow, translucent, in small mamilliform masses, having a mild terebinthinate odour and taste. Only a small part of it is soluble in rectified spirit, causing a slight turbidity; in water it rapidly disintegrates, forming a tolerably thick mucilage, in which globules of oleoresin may be seen with the microscope; the insoluble portion is amorphous, flaky and white; after its removal the mucilage is precipitated milk white by rectified spirit. In Salsette, near Bombay, the juice of the stem is dropped into the eye to cure opacities of the conjunctiva; the fruit, which is greenish yellow, and about the size of a gooseberry, is pickled and eaten as a cooling and stomachic remedy; it is strongly acid. In the Concan the juice of the leaves, with that of the leaves of Adhatoda vasica and Vitex trifolia, mixed with honey, is given in asthma.

Canarium strictum, *Roxb., Hort. Beng.*, 49. The resin.

Vernacular.—Kálá-damár (*Hind.* and *Bomb.*), Karrapudámar (*Tam.*)

History, Uses, &c.—The black dammar tree of Malabar is common about Courtallum in the Tinnevelly district and in Canara. The resin is transparent and of a deep brownish yellow to amber colour, when held between the eye and the light, but when adhering to the tree it has a bright shining black appearance. Dr. Bidie speaks of it as a substitute for Burgundy pitch. (Phar. of India.) The following is Mr. Broughton's report upon black dammar:—"This well-known substance offers little chance of usefulness, in Europe at least, when the many resins are considered which are found in the market at a far less price. It is used in this country for many small purposes, as in the manufacture of bottling wax, varnishes, &c. Its colour when in solution is pale, as compared with its dark tint when in mass; though insoluble in spirit its solution in turpentine forms a tolerable varnish. When submitted to destructive distillation it yields about 78 % of oil, resembling that obtained from common colophony; but I fear that in the majority of its possible applications it possesses few advantages over ordinary resin at 7*s.* 6*d.* per cwt. Major Beddome estimates the price of black dammar on the coast of Canara at Rs. 8 per 25 lbs. (nearly ten times the price of resin in England)." Mr. Broughton's remarks apply in Bombay, where American resins, and dammars from Singapore, are plentiful and cheap.

MELIACEÆ.

Melia Azadirachta, *Linn., Bent. & Trim., t.* 62; *Wight Ic., t.* 17. The bark, leaves, fruit, gum, and oil of the seeds.

Syn. Azadirachta indica.

Vernacular.—Ním, Bál-nimb. (*Hind.* and *Bomb.*), Vimbu, Vêppam (*Tam.*)

History, Uses, &c.—This tree, in Sanskrit Nímba, is a native of India, and is cultivated in all parts of the country on account of its medicinal properties. The leaves, bark and other products of the Ním have been articles of the Hindu Materia Medica from a very remote period, and are mentioned in the Ayurvedas of Susruta. The bark is considered to be bitter, tonic, and astringent. The leaves are added to poultices to disperse glandular tumours, and are used generally as a discutient; beaten into a pulp they are applied to pustular eruptions, more especially to the eruption of small-pox; their juice is anthelmintic, and is given in a variety of diseases, such as jaundice, purigo, boils, &c. Chakradatta recommends a poultice of the leaves mixed with Sesamum seeds for unhealthy ulcerations. The fruit is described as purgative, emollient, and anthelmintic. The oil of the seeds is applied to suppurating scrofulous glands, is given in leprosy, and a variety of diseases. The gum is said to have stimulant properties. The young trees tapped yield a saccharine juice, which when fermented is used as a stomachic; several observers have noticed that in certain years this juice appears to flow with unusual abundance. The air waved with a Ním branch is supposed to be a cure for syphilis, hence the Hindustani saying—"Khuda kare ním kí tahní háth men ho." "May God place a ním branch in his hand." *Anglice,*—"A pox take him." The insane are passed through a cleft of the tree or a stem which having parted and reunited froms a circular opening. This useful tree naturally attracted the attention of the Mahometans upon their arrival in the country, and they named it Azaddarakht-i-Hindi, from its resemblance to the Melia Azedarach or Persian lilac. The author of the Makhzan-el-Adwiya is careful to point out that the Indian Ním is not found in Persia. He describes the Ním and Azadarakht separately, giving Bakayan as the Indian name for the latter. The quotation from the Makhzan in the Bengal Dispensatory appears to be incorrect, as I can find no such statement under the articles Ním or Azaddarakht. The Mahometans use the different products of the Ním in the same manner as the Hindus, and like them consider it to be cold and dry. Amongst European physicians, Dr. White, of Bombay, has recommended the bark as a febrifuge; others have spoken favourably of the leaves as a local application to ulcers and certain obstinate skin diseases. Dr. Hove (1787) thus speaks of the Ním tree:—"The Gentoos here worship this tree, and their barren women invoke and perform the same ceremonies round it every morning as they usually do in the other Pergunnahs about the Ficus religiosa. The leaves are of a powerful bitter, and they use a strong decoction with great success in intermittents, and which I usually drank for my liver complaint and found myself much relieved by it." He also notices the use of the gum by lying-in women.—(Hove, account of Mitampoor.) From recent experience detailed in the Pharmacopœia of India, it would appear that the opinion of the natives of India regarding the medicinal properties of the different parts of this tree is substantially correct. The bark is now official in the abovementioned Pharmacopœia.

Description.—Ním bark is coarsely fibrous; it varies much in thickness according to the age of the tree from which it is taken. The external surface is rough fissured and of a rusty grey colour; the inner surface yellowish and foliaceous. A transverse section shows three layers—1*st,* The suberous coat, consisting of a brown parenchymatous tissue intersected by small bands of cork cells; 2*nd,* a dark cellular layer; 3*rd,* the layer of liber. The taste is bitter and astringent. The leaves are simply pinnate, leaflets 9 to 15, ovate, lanceolate, unequal sided, acuminated, serrated, 1 to 3 by $\frac{1}{2}$ to $1\frac{1}{2}$ inches, very bitter. The fruit when ripe is purple, 1-celled, 1-seeded, $\frac{1}{2}$ to $\frac{3}{4}$ in. long; within the fleshy portion is a thin hard woody shell, which encloses an oily bitter kernel like a small filbert, greenish white, with a brown testa. The dried fruit resembles a sultana raisin, the inner portion of the pulp is adherent to the stone, and fibrous from the presence of very large liber cells. The expressed oil is of a pale yellow colour and bitter taste. The gum is yellowish, like inferior gum Arabic, generally in longish vermiform pieces, not bitter, and freely soluble in cold water.

Microscopic structure.—According to the Pharmacographia, the suberous coat consists of numerous layers of ordinary cork cells, which cover a layer of nearly cubic sclerenchymatous cells. This latter, however, is not always met with, secondary bands of cork (rhytidoma) frequently taking its place. The liber is commonly built up of strong fibre-bundles traversed by narrow medullary rays, and transversely separated by bands of parenchymatous liber tissue. Crystals of oxalate of calcium occur in the parenchyme more frequently than the small globular starch grains. The structure of the bark varies considerably according to the gradual development of the secondary cork bands. I have examined the fresh bark and find that it agrees with this description.

Chemical composition.—Ním or Margosa bark was chemically examined by Cornish in 1856, who found in it a bitter alkaloid to which he gave the name of Margosine, but which he obtained only in minute quantity as a "double salt of Margosine and Soda" in long white needles. From the bitter oil of the seeds he isolated a substance which he called Margosic acid, and which he doubted to be capable of affording crystallizable salts. The composition of neither of these substances is known, nor have their properties been investigated. An infusion of the bark gives with perchloride of iron a blackish precipitate; the infusion is not altered by tannic acid or iodo-hydrargyrate of potassium. If the inner layers of the bark are alone exhausted with water, the liquid affords an abundant precipitate with tannic acid; but if the entire bark is boiled in water, the tannic matter which it contains will form an insoluble compound with the bitter principle and prevent the latter being dissolved. (Pharmacographia, p. 137.) According to Broughton, the bitter principle of the bark is a neutral resin, having scarcely any definite reactions. It may be obtained by exhausting the bark with alcohol of 60 per cent., precipitating the filtered tincture with water, and purifying the precipitate by solution successively in benzine, carbon sulphide, dry ether, and, finally, absolute alcohol. It is soluble in strong boiling solutions of the fixed alkalis, from which acids precipitate it apparently unaltered. It does not form definite compounds with acids or with bases, but on treating it with nitric acid and precipitating with water, a nitro-derivative is obtained, having the composition $C^{38} H^{46} (NO^2)^4 O^{11}$, hence the formula of the bitter principle is inferred to be $C^{36} H^{50} O^{11}$.

The leaves contain a small quantity of a bitter substance of a similar character but much more soluble in water. This substance, also contained in the bark, is a hydrate of the resin, which it closely resembles in its properties.—(*Pharm. Journ.*, (3), iii. 992.) The oil of the almonds is yellow, sp. gr. 0·921; it tastes bitter and smells like garlic; it congeals at + 7° and yields by saponification 35 p. c. of fatty acids melting at 30°, and 65 p. c. melting at 44°. (Lepine.)

Melia azedarach, *Linn.*, *Wight Ic.*, *t.* 160; *Bot. Mag.*, *t.* 1066. The root-bark and fruit.

Vernacular.—Bakayan (*Hind.*), Wilayatí-ním (*Bomb.*), Malai-vembu, Malai-veppam (*Tam.*)

History, Uses, &c.—The Persian lilac was probably introduced into the southern parts of India by the Mahometans; it is a native of the sub-Himalayan tracts, and has a Sanskrit name, Mahanímba. The Hindus do not appear to have paid much attention to it, but it has been described by Ibn Sina in his second book under the name of Azaddarakht, and has long been used by the Arabs and Persians, who consider it to be hot and dry, and to have deobstruent, resolvent, and alexipharmic properties. The flowers and leaves are applied as a poultice to relieve nervous headaches. The juice of the leaves administered internally is said to be anthelmintic, antilithic, diuretic, and emmenagogue, and is thought to resolve cold swellings, and expel the humours which give rise to them. The bark and leaves are used internally and externally in leprosy and scrofula. A poultice of the flowers is said to kill lice and cure eruptions of the scalp. The fruit has poisonous properties, but nevertheless is prescribed in leprosy and scrofula. The root-bark of M. azedarach is placed in the secondary list of the United States Pharmacopœia as an anthelmintic. It has a bitter, nauseous taste, and yields its virtues to boiling water. It is administered in the form of decoction (4 ozs. of the fresh bark to 2 pints of water, boiled to one pint), of which the dose for a child is a tablespoonful every third hour until it sensibly affects the bowels or stomach, or a dose may be given morning and evening for several days and then be followed by a cathartic. In large doses it is said to produce narcotic effects, but these if produced pass off without any perceptible injury to the system.

Description.—The fresh root-bark is thick and rather spongy; the external surface is very scabrous and warty, of a dark brown colour, beneath the epidermis it is of a deep pink, internally white; taste acrid, nauseous, astringent, and slightly bitter.

Microscopic structure.—The cells containing red colouring matter are mostly grouped in patches immediately beneath the epidermis.

Melia dubia, *Cav., Beddome Fl. Sylv., t.* 12. The fruit.

Vernacular.—Nímbarra, Límbarra (*Bomb.*); the fruit Kálá Khajur, Kurrú Khajur (*Bomb.*)

Description, Uses, &c.—The dried fruit of this tree is sold in all the Bombay shops under these names, which mean black or bitter date. In size, shape, and colour it is very much like a date, but upon closer examination the pulp is found to adhere firmly to a large and very hard stone. The remains of the peduncle may also be seen to be different from that of a date. When soaked in water the fruit soon loses its shrivelled appearance and becomes like an oval yellowish-green plum. The skin is now seen to be thick and easily separated from the pulp, which consists of a delicate parenchyma supported by fibrous bands attached to the stone. The apex of the fruit is blunt, and studded with small tubercles. At the base is attached the five-partite calyx, and a small portion of the fruit stalk. The stone is an inch in length, obscurely five-furrowed, oblong, perforated at both ends; apex 5-toothed round the perforation, 5-celled, or less from abortion; seeds solitary, lanceolar, attached from the apex; perisperm in small quantity; embryo straight, inverse; cotyledons lanceolate; radical oval, superior. The seed is $\frac{3}{4}$th of an inch long and $\frac{5}{6}$th broad; testa dark-brown or black, polished, kernel very oily, sweet tasted. The pulp of the fruit has a bitter nauseous taste. It is a favourite remedy amongst the labouring classes for colic, half a fruit being the dose for an adult. It appears to have hardly any purgative properties, but is said to relieve the pain most effectively. In the Concan the juice of the green fruit with a third of its weight of sulphur and an equal quantity of curds heated together in a copper pot is used as an application to scabies.

Microscopic structure.—The cells of the fruit pulp are seen to be full of oil globules and fine granular matter, and the skin to consist of one row of columnar cells covered by a horny epidermis.

Commerce.—M. dubia is found here and there upon the Western Ghauts, but is only abundant in the southernmost part of the Bombay Presidency, in the district of Soonda, where it is a large forest tree. The fruits are sold for Re. 1-4 per lb.

Naregamia alata, *W. and A.,* *Wight Ic., t.* 90; *Rheede Hort. Mal. x., t.* 22. The plant.

Vernacular.—Kápúr bhendí, Pit-wel, Tínpana (*Mar.*), Trifolio (*Goa*).

Description, Uses, &c.—This is the country Ipecacuanha of the Portuguese at Goa. I have been unable to find any historical notices of the drug. It is a small woody shrub, seldom more than 6 to 8 inches high, consisting of several slender stems, sparingly branched, and rising from a spreading root-stock, which is contorted, knotty and warty. The leaves are alternate, mostly situated at the ends of the branches, and consist of a narrow winged petiole $\frac{3}{4}$—1 inch long, at the end of which are articulated three small cuneate-obovate leaflets. The ends of the shoots and buds are seen under the microscope to be thickly covered with white simple hairs; the petiole and leaflets are nearly free from them. The flowers are large and white on axillary peduncles; the capsules 3-angled and 3-valved. The drug consists of the creeping root with the slender stems attached to it, the leaves having been stripped off. It has a somewhat pungent, aromatic odour, but hardly any taste; and is given as an emetic in doses of from 12 to 18 grains. In Southern India it is used as a remedy for rheumatism. In the Concan the Hindus use the leaves and stems in decoction with bitters and aromatics as a remedy for biliousness.

Microscopic structure.—A section of the root presents a tolerably thick dry suberous layer of a brown colour; immediately within this, the parenchyma, which is composed of thin walled cells, is much loaded with a yellowish oil. In the inner portion of the bark the cells contain starch; the wood is very hard and of a greenish yellow colour.*

Turrœa villosa, *Benn., Wight Ic., t.* 1593, is also called Kápur-bhendí; the root is used as an application to fistulas, and is administered internally in black leprosy.

Soymida febrifuga, *Juss., Bentl. & Trim., t.* 63.

Vernacular.—Rohan or Rohán (*Hind.* and *Bomb.*), Shemmaram (*Tam.*)

History, Uses, &c.—The astringent and febrifuge properties of this bark are known to both Hindus and Mahometans, and short notices of it are to be found in some of their books on Materia Medica. Roxburgh was the first to introduce it to the notice of Europeans as a substitute for the Peruvian bark. Ainslie describes it and says, "given to the extent of four or five drachms in the twenty-four hours I have found it to be a useful medicine, but beyond that quantity, it, in every instance in which I tried it, appeared to me to derange the nervous system, occasioning vertigo and subsequent stupor." The authors of the Bengal Dispensatory thus summarize its properties :—" It seems to us to be exactly similar to the mahogany bark, useful where astringent tonics are applicable, but of very questionable efficacy as a true antiperiodic." In 1791 Roxburgh sent the bark to Edinburgh, where Duncan made it the subject of a thesis,† which led to its admission into the Edinburgh and Dublin Pharmacopœias. It appears never to have attracted much attention in England, but recently it has been made official in the Pharmacopœia of India as a useful astringent tonic. I have not known it to be used in native or European practice in Bombay, though the tree is found in several parts of the Presidency.

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* In the Southern Concan it is called Pit-yel or Pitpápra on account of its well marked emetic and bile expelling properties; it is the best indigenous emetic on this side of India.

† Tentamen de Swietenia Soymida, Edin. 1794.

Description.—Flückiger and Hanbury describe the bark from a young tree as occurring in straight or somewhat curved half tubular quills, an inch or more in diameter, and about 1-5th of an inch in thickness. Externally it is of a rusty grey or brown, with a smoothish surface, exhibiting no considerable furrows or cracks, but numerous small corky warts. These form little elliptic scars or rings, brown in the centre, and but slightly raised from the surface. The inner side and edges of the quills are of a bright reddish brown. A transverse section exhibits a thin outer layer coloured by chlorophyll, and a middle layer of a bright rusty hue, traversed by large medullary rays and darker wedge-shaped rays of liber. The latter has a fibrous fracture, that of the outer part of the bark being rather corky or foliaceous. The whole bark when comminated is of a rusty colour, becoming reddish by exposure to air and moisture. It has a bitter astringent taste, with no distinctive odour. (Pharmacograpia, p. 138.) To this I may add that the old bark has a ragged dry suber, a quarter of an inch thick, and of a rusty blackish brown colour, deeply fissured longitudinally, and minutely cracked transversely; the small corky warts described above are still visible here and there between the fissures. Old bark is generally in half quills, the total thickness being about half an inch; its colour is a rich red brown; its substance when soaked in water becomes very compact.

Microscopic structure.—The ring of liber is made up of alternate prosenchymatous and parenchymatous tissue. In the latter the larger cells are filled with mucilage, the others with starch. The prosenchymatous groups of the liber exhibit the peculiar form known as *hornbast*; it chiefly contains the tannic matter, besides stellate crystals of oxalate of calcium, which are distributed through the whole tissue of the bark. The corky coat consists of vaulted cells.

Chemical composition.—The bitter principle of the bark has been ascertained by Broughton to be a nearly colourless resinous substance, sparingly soluble in water, but more so in alcohol, ether or benzol. It does not appear to unite with acids or bases, and is less soluble in water containing them than in pure water. It has a very bitter taste, and refuses to crystallise either from benzol or ether. It contains no nitrogen. To this I may add that the bark is rich in tannic acid.

Commerce.—The bark is not an article of commerce in Bombay.

Other allied barks having similar properties.—Cedrela Toona, *Roxb., Vern.*—Tún (*Hind.* and *Bomb.*), Tunu-maram (*Tam.*), has a powerfully astringent bark, which is said to be used by native physicians in combination with Bonduc nuts as a tonic and antiperiodic; the flowers (Gul-tún) are considered emmenagogue. Nees von Essenbeck has published an account of some experiments with the bark which indicate the presence in it of a resinous astringent matter, a brown astringent gum, and a gummy brown extractive matter, resembling ulmine. I have not seen it used in this part of India. The wood resembles mahogany, and is used in Bombay for making medicine chests, and surgical instrument cases.

Chloroxylon swietenia, *D. C., Wight Ill. i., t.* 56; *Beddome Fl. Sylv., t.* 11.

Vernacular.—Billú, Hardi (*Bomb.*), Múdúda, Vummaay, Kodawahporsh (*Tam.*)

The astringent bark is prescribed sometimes by Hindu physicians, but it is not in common use, nor is it to be met with in the shops. The wood is of much more importance, being the satin wood of India; it is oily, and turns well, making nice stethescopes, &c.

CELASTRINEÆ.

Celastrus paniculata, *Willd.*, *Wight. Ill.* 179, *t.* 72; *Ic.*, *t.* 158. The seeds and oil.

Vernacular.—Málkangní (*Hind.* and *Bomb.*), Valuluvai, Atiparich-cham (*Tam.*), Kángoní, Pigaví (*Mar.*)

History, Uses, &c.—The seeds have long been in repute with Hindu physicians on account of their acrid and stimulating properties; they are also treated of at some length in Mahometan works on Materia Medica, but their accounts seem to be only recapitulations of what the Hindus have said about the drug. The seeds are thought to be hot and dry, aphrodisiacal, and stimulant, useful both as an external and internal remedy in rheumatism, gout, paralysis, leprosy, and other disorders which are supposed to be caused by cold humours. They may be administered in such cases commencing with a dose of one seed to be gradually increased to fifty by daily increments of one, at the same time the oil may be applied externally, or the crushed seeds combined with aromatics. The latter application is said to be very efficient in removing local pains of a rheumatic or malarious nature. Another preparation for internal administration is made by placing the seeds with benzoin, cloves, nutmegs, and mace into a perforated earthen pot, and then obtaining by distillation into another pot into which it is fitted a black empyreumatic oil. This substance was brought to notice by Herklots as a remedy in Beri-beri under the name of *oleum nigrum*. In doses of from 10 to 15 drops twice a day it acts as a powerful stimulant, and generally produces free diaphoresis. In the Concan 4 tolás of the leaf-juice are given as an antidote in overdoses of opium, and the seeds made into a paste with cow's urine are applied to cure scabies.

Description.—The fruit is a 3-celled, globose capsule containing from three to six seeds with a complete arillus; as seen in the shops the seeds are about the size of millet, of a reddish brown colour, oily and angular; the testa is hard, and the kernel white, taste acrid. The expressed oil is of a deep reddish yellow colour, and deposits a quantity of solid fat after it has been kept a short time. Its odour is pungent and acrid, sp. gr. at 80 F. 0·951. Treated with sulphuric acid it turns of a dark bistre colour.

Commerce.—The seeds and expressed oil are always obtainable in the shops. Value, seeds, 2 as. per lb.; oil, Rs. 20 per cwt.

Elœodendron glaucum, *Pers., Wight. Ill.* 178, *t.* 71. *Vern.*—Támrúj (*Bomb.*), Nerija (*Tel.*), Cheluppai-maram (*Tam.*) The leaves (Bhutapála) dried and powdered act as a sternutatory, and are used as a fumigatory to rouse women from hysterical syncope, and as a snuff to relieve headache. (Sakharam Arjún.) Roxburgh informs us that the fresh root bark when rubbed into a paste with water is applied by the natives to remove almost every sort of swelling.

In the Calcutta Exhibition Catalogue it is stated that the root is a specific against snake-bite, and that the bark is used in native practise and said to be a virulent poison.

Description.—Leaves opposite, short-petioled, oblong, and cuneate-oblong, sometimes very acutely, and sometimes obtusely serrate; texture hard, with both surfaces polished, the upper shining; apex rather obtuse, and always bent down, from 3 to 4 inches long, and about 2 broad. (Roxb.) The root bark is compact and brittle, and has a granular fracture; it occurs in small irregular fragments, is of a dull reddish colour, and is covered by a scabrous brittle suber, the external surface of which is brown or sometimes yellowish, and the substance and internal surface of a bright brick red. Some pieces of the bark show small warty prominences which are usually fissured exposing the brick red colour of the suber. The taste is astringent and bitter. The microscope shows that the bark is loaded with large crystals, which are chiefly deposited along the course of the vascular canals; the red colouring matter is mostly contained in separate cells, only a few stone cells are present, the friable nature of the bark is therefore due to the large crystalline deposit.

RHAMNEÆ.

Zizyphus vulgaris, *Lam.*, *Sibth. Fl. Græc. i.* 159, *t.* 241. The dried fruit.

Vernacular.—Unnáb (*Arab.* and *Bomb.*), Sinjid-i-jílání (*Pers.*)

History, Uses, &c.—This is the Jujube of Arabic and Persian works on Materia Medica, and is largely imported in a dry state both from the Persian Gulf and China. Mír Mohammad Husain describes it as "the fruit of a well-known tree of nearly the same size as the kunár* and olive, but having leaves a little thicker and longer than those of the kunár, with one side downy. The bark, wood and fruit of the tree are red. The best fruit comes from Jurjan, China and Nipal; it should be sweet and moderately astringent, about the size of a dried date and with a small stone." He gives a long account of the medicinal virtues of the Jujube, from which we gather that he regards it as a suppurative, expectorant, and purifier of the blood ; its uses would appear to be in many respects similar to those of dried prunes or raisins with us. Pliny, 15, 14, mentions Zizyphus as an exotic fruit coming from Syria, more like a berry than an apple. Sibthorp informs us that it is called in modern Greek παλιουρί, and is probably the παλίουρος of Dioscorides.† The French prepare a Pâté de jujubes by extracting 5 parts of jujubes in sufficient water to obtain 35 parts of infusion, in which are dissolved gum Arabic 30 parts and sugar 20 parts ; the solution is evaporated, two parts of orange flower water added, kept slowly boiling for twelve hours, and then poured into moulds. The bark of the tree is used to clean wounds and sores, the gum in certain affections of the eyes, and the leaves when chewed are said to destroy the power of the tongue to appreciate the taste of disagreeable medicines. In Western India we have several cultivated varieties of Jujube, which afford edible fruit, as well as a wild variety ; their bark is powerfully astringent, and a kind of lac, known as Bhúrí lák, is found upon the branches. The fruit of Zizyphus Jujuba is dried and powdered ; this powder is called in

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* Kunár or Kinár, Zizyphus jujuba, or wild Jujube.

† Dios. i., 106.

Hindí Bér-chúní. The young leaves are pounded with those of Ficus glomerata, and applied to scorpion stings in the Concan; they are also with acacia catechu leaves given as a cooling medicine in hot weather; dose 2 tolás. According to Ainslie, the root is prescribed in decoction by the Vytians in conjunction with sundry warm seeds, as a drink in certain cases of fever. The white pear-shaped fruit of Z. rugosa (Túrun, *Bomb.*), is eaten by the natives. The fruit of Z. xylopyra (Gútí, *Bomb.*), is used by shoemakers for blackening leather and for making blacking. The flowers of Z. rugosa, with an equal quantity of the petioles of the Betel leaf and half as much lime, are given in 4 grain pills twice a day for menorrhagia.

Description.—The dried fruit which comes from China is from 1 to 1½ in. long and ¾ in. broad; skin red, much shrivelled; pulp adherent to the stone, spongy, sweet and yellow; stone 7-10th in. long, very hard and rugose, apex sharp-pointed; shell very thick, seed oblong, flat, of a chestnut colour, 4-10th inch long and 2-10th broad. The fruit which comes from the Persian Gulf is somewhat smaller.

Chemical composition.—Jujubes contain mucilage and sugar. The bark contains tannin.

Commerce.—The Bombay market is supplied from China and the Persian Gulf ports. The Chinese fruit is preferred, as it is larger and sweeter. Value, Chinese, Rs. 8 per Surat maund of 37½ lbs.; Arabian, Rs. 4—5.

Rhamnus Wightii, *W. and A., Wight Ic., t.* 159. The bark.

Vernacular.—Rakta-Rohida (*Bomb.*)

Description, Uses, &c.—I have not been able to find any mention of this plant in the standard native works on Materia Medica; it appears to be confined to the Western Peninsula, where the bark is in much repute on account of its tonic, astringent and deobstruent properties. The shrub grows upon the highest hills in the northern parts of the Bombay Presidency. The bark as met with in the shops is in square, flat pieces or half quills, about ¼ of an inch thick; texture fibrous; external surface decorticated, dull red, nearly smooth; internal surface dull red, faintly striated. A transverse section shows numerous waved medullary rays of a darker colour than the rest of the bark. Portions of grey epidermis may be found here and there. The taste is strongly astringent. There are no distinctive microscopic characters, but the cells contain much red colouring matter.

Commerce.—The dried bark is to be found in most of the Bombay shops. Value, 2 as. per lb.

AMPELIDEÆ.

Vitis quadrangularis, *Wall.*, *Wight Ic.*, *t.* 51; *Rheede Hort. Mal. vii.*, *t.* 41. The stalk and leaves.

Vernacular.—Harsankar, Harjora, Kándawel, Nallar (*Hind.* and *Bomb.*), Pirandai (*Tam.*)

History, Uses, &c.—This is the Asthisanhára of Sanskrit writers. The leaves and stalks when young are sometimes used as a vegetable, when older they become acrid and are thought to have medicinal properties. Ainslie says that when dried and powdered they are prescribed by the Tamool practitioners in certain bowel affections connected with indigestion; they are also considered as powerful alteratives; of the powder about two scruples may be given twice daily in a little rice water. Forskahl states that the Arabs when suffering from affections of the spine make beds of the stems. The plant is common in hedges in Guzerat, and is there called Harsankar. The juice of the stem is dropped into the ear in otorrhœa, and into the nose in epistaxis, by the Marathas; it has also a reputation in scurvy, and in irregular menstruation; in the latter disease, 2 tolás of the juice, extracted by heating the plant, is mixed with 2 tolás of ghi and 1 tolá each of Gopichandan and sugar, and given daily.

Description.—A climbing glabrous plant with fibrous roots; stem 4-angled, winged; stipules lunate entire; leaves alternate, cordate-ovate, serrulated, short petioled; umbels shortly peduncled; stamens 4; petals 4, distinct; fruit globose, size of a large pea, very acrid, one-celled, one-seeded; seed solitary, obovate and covered with a dark brown spongy integument; flowers small, white, appear at the end of the rainy season.

Vitis adnata, *Wall., Wight Ic., t.* 144. The tubers.

Vernacular.—Kole-zán (*Bomb.*)

Description, Uses, &c.—This is a large climbing plant, with perennial tuberous roots, and fruit exactly like bunches of small black grapes. It is very common in this part of India. The whole appearance of the plant reminds one of the Vine. The roots form large bunches of tubers attached to a central root stock; the tubers are from one to two feet long, tapering at both ends, with a maximum diameter, when fresh, of from two to three inches; externally they covered are by a brown epidermis, and marked with small wart-like protuberances arranged in circular rings; internally they are red and juicy. A section shows a thick stringy cortical portion easily separable, and a central fleshy part of the consistence of a parsnip. Under the microscope the root is seen to be made up of a thin-walled parenchyma, the cells of which contain large oblong starch granules, and numerous bundles of needle-shaped crystals; the outer portion of the root and root bark is traversed by numerous very large fenestrated vessels. The taste is sweetish, mucilaginous and astringent. The dried tubers are used by the country people as an alterative in the form of a decoction; they consider that it purifies the blood, acts as a diuretic, and renders the secretions healthy.

V. carnosa, *Wall., Wight Ic., t.* 171; (*Vernacular*—Odi), and **V. setosa**, *Wall., Wight Ic., t.* 170. Both occur in the Bombay Presidency; they are excessively acrid, and the roots and leaves are sometimes externally applied as domestic remedies to promote suppuration.

Vitis vinifera, *Linn.*, *Bentl.* and *Trim.*, *t.* 66. Grapes and raisins.

Vernacular.—Grapes, Angúr, Dákh (*Hind.*), Drákh (*Bomb.*), Dirákhsha-pazham (*Tam.*)

Raisins, Kishmish (*Hind.* and *Bomb.*), Ularnda-dirákshap-pazham (*Tam.*)

History, Uses, &c.—Grapes, in Sanskrit Draksha, were known to the ancient Hindus, and are noticed by Susruta and Charaka; in the dried state they were used in medicine on account of their demulcent, laxative and cooling properties. It would also appear that a spirituous preparation was made from them, and was used as a stimulant under the name of Draksha-arishta, the receipt for making which is as follows:—Raisins, 12½ lbs., water 256 lbs., boil together until reduced to one-fourth and strain; then add, treacle 50 lbs., cinnamon, cardamoms, folia Malabathri, flowers of Mesua ferrea, fruit of Aglaia Roxburghiana, black pepper, long pepper and seeds of Embelia ribes, all in fine powder, of each 2¾ ozs., and set aside for fermentation. Grapes are descrbed by Dioscorides under the name of σταφυλή; he also notices raisins (σταφίς) and their medicinal properties.* Pliny speaks of Uvæ, grapes, and acini passi, raisins.† The τρὺξ ὄινου of the Greeks, Fæx vini in Latin, is our Argol; the Milhel-Tartír of the Arabs. Mahometan writers consider grapes and raisins to be attenuant, suppurative and pectoral; the most digestible of fruit, purifying the blood and increasing its quantity and quality; they say that they are more wholesome if kept a few days after being gathered, and that the skin and stones should not be eaten. The ashes of the wood are recommended as a preventive of stone in the bladder, cold swellings of the testes, and piles; in the two last named diseases they are to be applied externally as well as given internally. The juice of unripe grapes, *Husrum*, Arab., *Ghúreh*, Pers., is used as an astringent; it is the ὀμφάκιον of Dioscorides, and the Agresto of the modern Italians, who still use it in affections of the throat.

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* Dios. v., 3.

† Plin. 14, 1, *sq.*

Description.—The ovary of Vitis vinifera is 2-celled, with two ovules in each cell; it developes into a succulent, pedicellate berry of spherical or ovoid form, in which the cells are obliterated and some of the seeds generally abortive. As the fruit is not articulated with the rachis, or the rachis with the branch, it does not drop at maturity, but remains attached to the plant on which, provided there is sufficient solar heat, it gradually withers and dries: such fruits are called raisins of the sun. (Hanbury.)

Miscroscopic structure.—The outer layer or skin of the berry is made up of small tabular cells loaded with a reddish granular matter, which on addition of an alcoholic solution of perchloride of iron assumes a dingy green hue. The interior parenchyme exhibits large, thin walled, loose cells containing an abundance of crystals (bitartrate of potassium and sugar). There are also some fibro-vascular bundles traversing the tissue in no regular order. (Pharmacographia, p. 141.)

Chemical composition.—From the Pharmacographia we gather that the pulp abounds in grape sugar and cream of tartar, each of which in old raisins may be found crystallised in nodular masses; it also contains gum and malic acid. The seeds afford 15 to 18 % of a bland fixed oil, which is occasionally extracted. Fitz has shown that it consists of the glycerides of erucic acid, $C^{22} H^{42} O^{2}$, stearic acid and palmitic acid, the first named acid largely prevailing. The crystals of erucic acid melt at ·34° C.; by means of fused potash they may be resolved into arachic acid, $C^{20} H^{40} O^{2}$, and acetic acid, C^{2}, H^{4} O^{2}. The seeds further contain 5 to 6 % of tannic acid, which also exists in the skin of the fruit.

Commerce.—The Bombay market is supplied with very fair grapes from the Deccan; along the coast the climate is too moist for vine cultivation. A very superior half-dried grape, resembling those sold in Europe, is brought from Cabul packed in chip boxes. The raisins found here are the Sultanas from Cabul and Persia, some of which very large and of a pale greenish yellow colour, are called Angul Drákh; the black bloom raisins (Kálá Drákh) from the same countries, which are used for medicinal purposes; and an inferior kind called Munakha, like the pudding raisins sold in England.

Value, grapes from Deccan, 2 to 4 as. per lb.; Cabul, 4 as. per box.

Raisins, Cabul and Persian, Rs. 5-7 per Surat maund of 37½ lbs.; Bloom, Rs. 5; Munakha, Rs. 3; Angul Drákh, Rs. 6½.

Vitis araneosus, *Dalz.* and *Gibs., Bomb. Fl.* 41.

Vernacular.—Bendrí, Bender-wel, Ghorwel (*Bomb.*) The vine is often given to horses when it first springs up; it is said to be very beneficial once a year. The tuberous starchy astringent roots, sliced and dried, are sold by the Concan herbalists under the name of Chamar-musli.

Description.—Climbing; all floccose except the upper surface of the leaves; leaves dark green, pale beneath, cordate, acute, simple or trifoliate; leaflets oblong acute, unequal sided at the base; peduncles opposite the leaves, many flowered, cirriferous, rather long; fruit spherical, smooth, 1 to 4 seeded, size of a pea. (Bomb. Fl., p. 41, Cissus araneosus.)

Leea robusta, *Roxb.*

Vernacular.—Gíno (*Goa*). The root of this Leea, which is a common undershrub in jungles in the Goa territory, is called Ratanhia by the Portuguese, and is much used in diarrhœa and chronic dysentery. It is woody, porous and tough, and covered with a striated, dark brown slightly scabrous bark, the internal surface of which is of a deep red colour. The bark has an astringent and rather agreeable flavour; the wood appears to be inert. The shrub has large simply pinnate leaves and cymes of black berries about the size of a large currant.

Leea macrophylla, *Roxb., Wight Ic., t.* 1154; *Griff. Ic. Pl. As.* 645, *f.* 1.

Vernacular.—Dinda (*Bomb.*), Dholasamudrika (*Sans.*)

The tuberous root is employed in the cure of Guinea-worm, and when pounded is applied to obstinate sores to promote cicatrization; according to Roxburgh the root is astringent and a reputed remedy for ringworm. The young shoots are eaten as a vegetable.

Description.—Stem herbaceous, erect, flexuose jointed; leaves very large, simple, broad cordate, toothed, smooth on both sides; cymes terminal, large; flowers numerous, small, white; berry depressed, size of a small cherry, smooth, black and succulent when ripe; root tuberous.—(*Bomb. Flora.*) The tubers are of a deep red colour, 3 to 6 inches long, and 1 to 2 inches in diameter; they are very mucilaginous and astringent. The tubers of Leea crispa, *Wild.*, are also used as a remedy for Guinea-worm, and are said to be more efficient than those of L. macrophylla.

SAPINDACEÆ.

Cardiospermum Halicacabum, *Linn.*, *Bot. Mag.*, *t.* 1049; *Griff. Ic. Pl. As. IV.*, *t.* 599, *f.* 3. The root and leaves.

Vernacular.—Lataphatkarí, Nayáphatkí (*Beng.*), Moodacottan (*Tam.*), Bodha, Shib-jal (*Bomb.*).

History, Uses, &c.—Sanskrit writers mention this plant under the name of Jyautishmati, and describe the root as emetic, laxative, stomachic, and rubefacient; they prescribe it in rheumatism, nervous diseases, piles, &c. The leaves are used in amenorrhœa. The following prescription is given in the Bhavaprakasha. Take the leaves of C. Halicacabum, impure carbonate of potash (sariká), acorus calamus root, root bark of Terminalia tomentosa, of each equal parts, and reduce to a paste with milk. About a drachm of this compound may be taken daily for three days in amenorrhœa. It is a favourite plant with the Arabs and Egyptians, who call it *Taftaf*. Rheede says that on the Malabar Coast the leaves are administered in pulmonic complaints. According to Ainslie, the root is considered aperient, and is given in decoction to the extent of half a teacupful twice daily. It would appear that in rheumatism the Hindus administer the leaves internally rubbed up with castor-oil, and also apply a paste made with them externally; a similar external application is used to reduce swellings and tumours of various kinds. A medicinal plant, called ἁλικάκαβος, and in pure Latin Vesicaria (Bladderwort), was known to the Greeks and Romans, and had a reputation for the cure of pains in the bladder. (Confer. Pliny 21, 31.) It is generally considered to have been a species of Physalis. C. Halicacabum is probably the Abrong or Abrugi of Serapion, who describes it as a round grain spotted with black and white, which is brought from China, having a bitter taste, hot and dry in the second degree, a laxative and vermifuge. According to Dodonæus and Parkinson it is the pea which the latter describes under the name of "pisum cordatum vesicarium." (Adams' Comment. on Paul. Æg.)

Description.—Annual, climbing; stem, petioles and leaves nearly glabrous; leaves biternate; leaflets stalked, oblong, much acuminated, coarsely cut and serrated; flowers small, white or pink; fruit a membranous bladdery capsule, 3-celled, 3-valved; seeds globose, black, with a two-lobed white aril at the base. Roots white and fibrous, with a rather disagreeable odour, and an acrid nauseous and somewhat bitter taste.

Sapindus trifoliatus, *Linn.*, *Wight Ill.*, *t.* 51; *Rheede Hort. Mal. iv.*, 43, *t.* 19. The fruit.

Vernacular.—Ritha (*Hind.* and *Bomb.*), Ponnán-kottai (*Tam.*), Ringin. (*Mar.*)

History, Uses, &c.—The soapnut, in Sanskrit Phenila, has probably been in use among the Hindus from the earliest ages as a detergent. Both Hindus and Mahometans use it medicinally; the latter on their first arrival in the country gave it the name of Banduk or Finduk-i-Hindí (Indian Filbert). The following account of its use is extracted from the Makhzan-el-Adwiya:—"The pulp of the fruit is at first sweetish to the taste, afterwards very bitter; it is hot and dry, tonic and alexipharmic; four grains in wine and sherbet cure colic; one miskal rubbed in water until it soaps, and then strained, may be given to people who have been bitten by venemous reptiles, and to those suffering from diarrhœa or cholera. Three or four grains may be given by the nose in all kinds of fits producing insensibility. Fumigations with it are useful in hysteria and melancholy; externally it may be applied made into a plaster with vinegar to the bites of reptiles and to scrofulous swellings. The root is said to be useful as an expectorant. Pessaries made of the kernel of the seed are used to stimulate the uterus in child-birth and amenorrhœa. One miskal of the pulp with one-eighth of a miskal of scammony acts as a good brisk purgative." Ainslie mentions its use by the Vytians as an expectorant in asthma. In Bombay it is given successfully as an anthelmintic in four grain doses.

Description.—Berries three, united, when ripe soft, of a yellowish green colour, singly they are of the size of a cherry somewhat reniform, with a heart-shaped scar on the attached side. When dry they are of the colour of a raisin, skin shrivelled, pulp translucent, absent on the attached side. The inner shell enclosing the seed is thin, tough and translucent like parchment, except at the scar, where it is woody. Seed the same shape as the fruit, black, smooth, except at the hilum, where it is tomentose, size of a large pea; on the upper part of the dorsum of the seed are two shallow diverging furrows; the testa is double, the outer very thick and hard, the inner membranaceous; kernel yellowish green, oily; cotyledons unequal, thick, firm and fleshy, spirally incurvate. Radicle inferior, linear, lodged at the base of the seed, pointing to the lower and inner angle. The pulp of the fruit has a fruity smell; its taste is sweet at first, afterwards very bitter.

Chemical composition.—The active principle of the soapnut is Saponin. Rochleder from a renewed investigation of saponin and its products of decomposition (Zeitschr f Chem. [2] III. 632) deduces for saponin the formula $C^{32} H^{54} O^{18}$, and for sapogenin $C^{14} H^{22} O^{2}$, whence the complete decomposition of saponin would be represented by the equation—

$$C^{32} H^{54} O^{18} \times 2 H^{2} O = C^{14} H^{22} O^{2} \times 3 C^{6} H^{12} O^{6}.$$

Sapogenin is soluble in alcohol and ether, and crystallises from the former by slow evaporation in concentric groups of needles. From solution in dilute aqueous potash it is precipitated by stronger potash-ley, as flocculent potassium sapogenin ; the solution in alcoholic potash is precipitated by water only when the potash is in excess. When sapogenin is heated with potassium hydrate till decomposition commences, part of it is resolved into acetic acid, butyric acid, and a soft brown substance, and the undecomposed portion when separated by potash melts at 128°, whereas before the treatment with potash it does not liquify at that temperature. The compound obtained by Fremy from saponin, and designated as æsculic acid, is regarded by Rochleder as $C^{26} H^{42} O^{12}$, and its formation is represented by the equation—

$$C^{32} H^{54} O^{18} = C^{26} H^{42} O^{12} \times C^{6} H^{12} O^{6}.$$

Commerce.—Soapnuts are brought to market from many parts of the country. Value, Rs. 2½ to Rs. 3 per pharrah (35 lbs.)

Sleichera trijuga, *Willd.*, *Gärt. Fruct.*, *t.* 180 ; *Vern.*—Kúsimb (*Bomb.*), is common in the Bombay Presidency. The natives eat the fruit and also make oil from the seeds. According to Roxburgh the bark rubbed up with oil is used to cure itch. I have not seen it used for this purpose in Bombay, but Dr. S. Arjun states that the oil is used for the cure of itch and acne.

Dodonæa viscosa, *Linn., Wight Ill. i., t.* 52.

Vernacular.—Bandárí, Zakhmi.

The leaves of this shrub are viscid and have a somewhat sour and bitter taste. The plant is widely diffused, and in Jamaica is called "Switch Sorrel." According to Dr. Bennett it is known in Tahiti as "Apiri," and fillets of it were once used for binding round the heads and waists of victors after a battle. The leaves of D. Thunbergiana are used in South Africa against fevers and as a purgative. According to Graham the plant found in the Deccan is D. Burmanniana, D. C., but it does not appear to differ from D. viscosa; it is used medicinally, and has been sent to me from Poona and from Belgaum as having febrifuge properties.

ANACARDIACEÆ.

Pistacia integerrima, *Stewart, Brandis, For. Fl.* 122, *t. xxii.* Syn. Rhus Kákrasingi. The gall.

Vernacular.—Kákrasingí (*Hind.* and *Bomb.*), Kákkatashingí (*Tam.*)

History, Uses, &c.—These galls, called in Sanskrit Karkatasringí, have long held a place in the Materia Medica of the Hindus. They are considered tonic, expectorant, and useful in cough, phthisis, asthma, fever, want of appetite, and irritability of stomach. The usual dose is about 20 grains combined with demulcents and aromatics. Mahometan writers describe them as hot and dry, useful in chronic pulmonary affections, especially those of children, also in dyspeptic vomiting and diarrhœa; they notice their use in fever and want of appetite, and say that they are a good external application in cases of psoriasis. European writers mention the drug, but afford no information as to its properties.

Description and Microscopic structure.—The galls are generally single, but sometimes lobed, of a purse-like form, and vary much in size. The average may be, length 1½ inch, breadth 1 inch, thickness ¼ inch. The external surface is of a pale greenish grey, and has a fimbriated appearance. Near the neck or attached end may be seen the midrib of the leaf upon which the gall has been formed; it appears to be split in two; between the halves is a kind of mouth with smooth everted edges (the passage by which the aphides have escaped). On breaking open the gall, which is brittle and about 1-16th of an inch in thickness, the irregular rugose inner surface is seen; it is of a reddish colour, and appears as if covered with particles of dust. This on microscopic examination proves to consist of the *debris* of the former inhabitants of the sac, *viz.*, numerous egg shells beautifully white and transparent, broken portions of the insect, and a quantity of what appears to be excrementitious matter; sometimes the entire skeleton of an aphis may be seen. This insect as obtained from the dry gall is of an oblong form and brown colour, rather more than 1-16th of an inch in length, the whole body covered with short bristles, four long ones at the end of the abdomen; it has six legs, each armed with two claws; the abdomen is divided into eight segments; the head is armed with a proboscis containing an awl-shaped instrument, and is provided with bristly feelers; the shell of the gall when fractured presents a crystalline appearance; a thin section shows it to consist of a cellular stroma, the greater number of the cells being entirely filled with a yellowish highly refractive substance. The taste is strongly astringent and slightly bitter.

Chemical composition.—No examination has been made, but there can be no doubt that the galls contain a large proportion of tannin.

Commerce.—The drug is imported from Northern India, but not in very large quantities. Value, Rs. 2½ to Rs. 3 per maund of 37½ lbs.

Rhus coriaria, *Linn., Dend. Brit.* 136. The fruit.

Vernacular.—Sumák (*Arab.* and *Bomb.*), Tatrak (*Hind.*)

History, Uses, &c.—The leaves of this tree have long been well known in Europe as an article of commerce; they would appear also to have been for a long time in use among the Arabs, Turks, and Persians for dyeing and dressing leather. The fruit was formerly used in Europe as an astringent in dysentery, and is still much used by the Mahometans as a medicine. It is described by Dioscorides under the name of ῥοῦς as the fruit of a plant used* for tanning, Pliny calls it Rhus,† and Scribonius Largus mentions it as an ingredient in astringent medicines.‡ R. coriaria is not a native of India, but the fruit is imported in considerable quantities from Persia. It does not appear to be used by the Hindus. The tree is well described in the Makhzan-el-Adwiya by Mír Mohammad Husain, who says that the fruit is cold and dry, astringent, and tonic, that it checks bilious vomiting and diarrhœa, hœmoptysis, hœmatemesis, diuresis and leucorrhœa, strengthens the gums, and is useful as an astringent in conjunctivitis. Alone or mixed with charcoal it is applied to sores, suppurating piles, &c. A kind of liquid extract is made by boiling down the leaves and fruit, which is used as an astringent: poultices of the leaves are recommended as an application to the abdomen in the diarrhœa of children. He also mentions the gum and the russet-coloured down of the fruit as having powerfully astringent properties. Ainslie notices the use of the leaf and fruit in India by the Mahometans as a styptic, astringent and tonic; also their former use in France as an astringent in dysentery, in doses of 24 grains.

Description.—The fruit is a small flattened drupe the size of a lentil, of a red colour, containing one lenticular polished brown seed; it is acid and very astringent. The leaves are about a foot long, pinnate, with from 5 to 7 pairs of leaflets and an odd one, like the leaves of the common elm; the petioles and midribs of the leaflets are covered with a reddish brown tomentum; the leaflets are hairy and very astringent.

Chemical composition.—The leaves contain colouring matter and tannin, and are used in dyeing and calico printing as a substitute for gall nuts, in the production of grey colours, and in Turkey red dyeing; also for tanning the finer kinds of leather. According to Chevreul they contain a yellow colouring matter, which separates from a concentrated decoction on cooling in small crystalline grains. The decoction forms a yellow precipitate with solution of alum, shows a strongly acid reaction with litmus, gives a yellowish white precipitate with stannous chloride, pale yellow with acetate of lead, yellowish brown with cupric acetate, and a blue flocculent precipitate with ferric chloride. Tromsdorf found in the fruit a large quantity of bimalate of lime.

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* Dios. i., 128.

† Plin. 29, 11.

‡ Scrib. Comp. 111 and 142.

Commerce.—Sumak is imported into Bombay from Persia. Value, 6—8 annas per lb.

The fruit of an Indian Rhus, probably R. parviflora, called in Hindí Tatrak, is sometimes substituted for it.

Pistacia Terebinthus, *Linn.*, *Blackw.*, *t.* 478. Syn. P. Cabulica, and P. Khinjuk. The resin and galls.

Vernacular.—The resin, Mastakí (*Bomb.*); the galls, Gul-i-Pista, Buzghanj (*Bomb.*)

History, Uses, &c.—Very little true Mastich is imported into Bombay, its place being supplied by the resin of P. terebinthus,* which grows in Afghanistan and Beloochistan. The Hindus consider this substance to be corroborant and balsamic, and take it in combination with salep as a restorative. The Mahometans in India use it instead of true Mastich, which is an article of considerable importance in their Materia Medica, being considered detergent, astringent, and restorative, and of value as a masticatory, strengthening the gums and perfuming the breath. I have been unable to find any distinct mention of this kind of Mastich in Arabic and Persian works, unless the Ilak-el-ambât (Turpentine of the Nabatheans) of Ishak bin Imrân refers to it. He describes it as the turpentine of the

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* The *τερμινθος* of the Greeks, (Dios. i., 78,) and the Terebinthus of the Romans (Plin. 13, 6; 24, 6) who used the fruit, buds (galls?) and resin.

Pistachio tree. The author of the Makhzan-el-Adwiya states, upon the authority of Ambarí, that the word Mastaki is derived from the Greek.* He gives as its Arabic equivalent Ilak-Rumi. The Cabul Mastich sometimes appears in the European markets as East Indian or Bombay Mastich; according to Flückiger and Hanbury its solution in acetone or benzol has the same optical properties as that of true Mastich; it deviates the ray of polarised light to the right. (For an interesting account of true Mastich, confer. Pharmacographia, p. 142.)

The galls and fruit of P. terebinthus are used medicinally and also for tanning and dyeing; they are described in Arabic and Persian works as cold, dry, and astringent. Mír Mohammad Husain refutes the vulgar opinion that they are the abortive fruit of the Pistachio, and that the trees bear in alternate years nuts and Gul-i-Pista, but it appears that P. vera does produce galls which are not to be distinguished from those of P. terebinthus.

Description.—The general appearance of Bombay Mastich is the same as that of true Mastich, but the colour is rather deeper, and it wants the fine perfume of the latter article. The galls when fresh are bright pink on one side and yellowish white on the other; they vary much in shape and size, some being perfectly fig-shaped and others almost spherical, the majority are ovoid; at one end a portion of leaf often remains attached; here may be seen an open stoma which communicates with the interior of the sac; the apices are pointed, often mucronate. The largest galls have a diameter of from 5-8th to 6-8th of an inch, some are no larger than a pea. The walls are thin, brittle, and translucent; the taste acidulous, very astringent and slightly terebinthinous; the odour terebinthinous. Most of the sacs contain only a little fecal *debris*, but in some skeletons of an aphis may be found. According to Lichtenstein this aphis (Anopleura Lentisci) runs through the following stages:—The fecundated female deposits in May or June its eggs on the pistachio tree; these hatch into a wingless form, to which the pistachio gall owes its origin; the wingless form produces, without being fecundated, another brood, which acquire wings and quit the gall and pass to the roots of certain grasses (Bromus sterilis and Hordeum vulgare), and then produce wingless young, and these after a longer or shorter series of wingless generations, until the period of swarming and of the appearance of the nymphs, furnish a winged sexual generation, which return to the pistachio tree and again commence the cycle. Buzghanj is chiefly used for dyeing silk and tanning the finer kinds of leather; in Bombay only for dyeing. It is used in native practise as an astringent.

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* *σχῖνος* frequently mentioned by the Greeks (Theoph. ix. 1; Dios. i., 77.) It is the Lentiscus of the Romans (Plin. 15, 6), who used the wood for making toothpicks. (Mart. 14, 22; 3, 82; 6, 74.)

Commerce.—The price of Bombay Mastich ranges from eight to twelve annas a pound.

The galls are worth Rs. 11½ per Surat maund of 37½ lbs.

Mangifera Indica, *Linn., Beddome Fl. Sylv., t.* 162; *Gärt. Fruct., t.* 100. The fruit, kernel, leaves, flowers, bark, and gum.

Ámb, Ám (*Hind.*), Amba (*Bomb.*), Mángamaram (*Tam.*), Amra (*Sans.*), Naghzak (*Pers.*), Ambaj (*Arab.*); the kernel, Amba-bátha (*Bomb.*)

History, Uses, &c.—Long articles upon the virtues of the Mango in its ripe and unripe state may be found in many of the Hindu and Mahometan works on Materia Medica*; shortly, we may say that they consider the ripe fruit to be invigorating and refreshing, fattening, and slightly laxative and diuretic, but the rind and fibre, as well as the unripe fruit, to be astringent and acid. The latter when pickled is much used on account of its stomachic and appetising qualities. Unripe mangoes peeled and cut from the stone and dried in the sun form the well-known Ámchúr or Ambosí, so largely used in India as an article of diet; as its acidity is chiefly due to the presence of citric acid, it is a valuable antiscorbutic; it is also called Ám-ki-chhiṭṭa and Ám-khushk. The blossom, kernel and bark are considered to be cold, dry and astringent, and are used in diarrhœa, &c., &c. The smoke of the burning leaves is supposed to have a curative effect in some affections of the throat. According to the author of the Makhzan the Hindus make a confection of the baked pulp of the unripe fruit mixed with sugar, which in time of plague or cholera they take internally and rub all over the body; it is also stated in the same work that the midribs of the leaves calcined are used to remove warts on the eyelids. Mangoes appear to have been known to the Arabs from an early date as a pickle; they were doubtless carried to Arabian ports by Indian mariners. Ibn Batuta, who visited India in 1332, notices their use for this purpose. The powdered seed has been recommended by Dr. Kirkpatrick as an anthelmintic (for lumbrici) in doses of 20 to 30 grains, and also as an astringent in bleeding piles and menorrhagia. (Phar. of India, p. 59.) From the fruit just before ripening, a gummy and resinous substance exudes, which has the odour and consistence of turpentine, and from the bark a gum is obtained which is soluble in cold water. Ainslie says that the gum-resin mixed with lime-juice or oil is used in scabies and cutaneous affections. I have never seen it used. The juice of the ripe fruits dried in the the sun so as form thin cakes (Amras, or Amaut, *Hind.*, Ambapoli, *Bomb.*), is used as a relish and antiscorbutic. Mango bark and fruit has been lately introduced by Dr. Linguist as a medicine in Europe; he recommends it for its extraordinary action in cases of haemorrhage from the uterus, lungs, or intestines. The fluid extract of the bark or rind may be given in the following manner:—Ext. Fl. Mangif. Ind., 10 grammes; water, 120 grammes. Dose—One teaspoonful every hour or two.

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* The Turkoman poet, Amír Khusrú, who lived in Delhi in the time of Muhammad Tughlak Shah, says of the mango :—

نغزک خوش نغزکن بوستان   نغز ترین میوهٔ هندوستان
میوه بباغ ارنه یکی ده بود   پخته شود خوردنش انکه شود
میوهٔ نغزک هم از آغاز بر   تا حد انجام سزاوار خور

The mango is the pride of the garden, the choicest fruit of Hindustan; other fruits we are content to eat when ripe, but the mango is good in all stages of its growth.

Description.—The Mango is a large fleshy drupe, ovoid or kidney-shaped; it varies much in size, ordinarily it is about as large as a goose's egg, but in the Southern Concan and Goa there is a variety which attains the size of a child's head. The stone is compressed and fibrous. The seed large, compressed, with a papery testa. The cotyledons are plano-convex, often unequal and lobed, their taste bitter and astringent. The gum occurs in irregular-shaped pieces, some of them stalactiform and shining ; it is variable in colour and brittle ; the fractured surface dull, the odour faint and gummy, entirely soluble in cold water, and very slighly viscid. At the time of flowering a gum-resinous exudation occurs upon the tender portions of the plant.

Chemical composition.—The kernels contain much tannin.

Professor Lyon (1882) examined the dried unripe peeled fruit, and found it to contain water 20·98, watery extract 61·40, cellulose 4·77, insoluble ash 1·43, soluble ash 1·91, alkalinity of soluble ash as potash ·41, tartaric acid, traces, citric acid 7·04, remaining free acid as malic acid 12·66, total free acid per 100 parts dry substance 24·93.

Anacardium occidentale, *Linn.*, *Beddome Fl. Syl.*, *t.* 163 ; *Rheede Hort. Mal. iii.*, *t.* 54. The fruit.

Vernacular.—Kájú (*Hind.* and *Bomb.*), Kottai-mundiri (*Tam.*), Hijli-bádám (*Beng.*)

History, Uses, &c.—A native of Brazil, which has been introduced into India by the Portuguese. The later Mahometan writers notice it as a variety of Biládur (Semecarpus anacardium) and call it Bádám-i-Farangi. In the time of Garcia d'Orta (1653), only a few trees existed on the Malabar Coast; since then it has become completely naturalized on the Western Coast, but is nowhere so abundant as in the Goa territory, where it yields a very considerable revenue. It is planted upon the low hilly ridges which intersect the country in every direction, and which are too dry and stony for other crops. The cultivation gives no trouble, the jungle being simply cut down to make room for the plants. When three years old the trees begin to bear. The principal products are, a spirit distilled from the fermented juice of the torus, the kernels of the nuts, and a tar obtained by burning the pericarp of the fruit. The apparatus used for extracting the juice from the torus consists of a large circular stone basin with a spout into which a heavy circular stone is fitted. The torus having been sliced is placed in the basin and the stone weight placed upon it; after all the juice has been expressed, it is allowed to ferment in earthen jars, and then distilled. The product is a weak spirit, which is sold for about 4 annas a gallon, and is also redistilled to about the strength of proof-spirit, when it is worth about Re. 1½ per gallon; no duty is levied upon this spirit by the Portuguese Government. The fruit is burnt in an earthen perforated vessel until the whole of the tar (Deek) has been extracted from the pericarp. The kernel which has become roasted slightly during this process is then removed and preserved for sale. The tar is largely used for tarring boats and wood-work, which it preserves from the attacks of insects. The nuts are exported, and are used in making native sweetmeats, and as a table fruit by Europeans. From the juice of the torus a kind of wine is made by the Portuguese; both it and the spirit are considered to have diuretic properties, and are valued as external applications in rheumatism. The leaves and flowers of the cashewnut are aromatic; from the stem exudes a large quantity of gum in stalactitic masses sometimes as thick as a man's wrist; it is made no use of in Goa, but is said to be used in America by book-binders to keep their books from the attacks of insects. The bark though not used in this part of India is said to have alterative properties. The tar already mentioned, which contains about 90 p. c. of anacardic acid and 10 p. c. of cardol, has recently been recommended as an external application in leprosy, ringworm, corns, and obstinate ulcers; it is powerfully rubefacient and vesicant, and requires to be used with caution. In native practice it is sometimes used as a counter-irritant, but the corresponding product of Semecarpus anacardium is preferred as being milder in its action. In Europe a tincture of the pericarp (1 to 10 of rectified spirit) has been used in doses of 2 to 10 minims as a vermifuge. It is stated (Buchheim) that the oil has a very faint and hardly acrid taste, and that 3 or 4 drops of it may be swallowed without marked effects. This contrast with its action on the skin is attributed to its total insolubility in the watery fluids of the digestive canal. According to Basiner the subcutaneous injection of small doses of cardol produces on cold-blooded animals paresis, increasing to paralysis of the extremities, stupor, paralysis of respiration and tetanic spasms. In warm-blooded animals large doses are not lethal, but stupor, paralysis of the extremities and diarrhœa occur, and after death congestion of the intestinal lining is found. Cardol seems to be excreted chiefly with the urine, but partially also with the fæces. Applied on a small piece of lint to the skin of the breast it raised a watery blister in 14 hours. (Am. Journ. Pharm., Mar. 1882, p. 131.) The kernel contains a bland fixed oil; it may be eaten raw or roasted.

Description.—The fruit, which is about an inch in length and kidney-shaped, is seated upon a large pyriform fleshy body 2 to 3 inches long, and coloured like an apple red and yellow, formed of the enlarged disk and top of the peduncle. The pericarp is cellular and full of oil; seed kidney-shaped, testa membranaceous, adherent; cotyledons semilunar; radicle short, hooked. The spirit has a peculiar and rather disagreeable flavour, which appears to be derived from a volatile aromatic principle present in the rind of the torus; this no doubt might be removed by proper rectification. The gum occurs in stalactiform masses, and varies in colour from reddish to pale yellow; when placed in water it swells and forms a jelly-like mass and a portion of it dissolves; this solution is rendered turbid by oxalate of ammonium, and gives a copious white precipitate with alcohol, it is not precipitated by borax or sulphate of iron.

Chemical composition.—Anacardic acid together with cardol is contained in the pericarps of the cashew nut. To obtain it they are extracted with ether, which dissolves out both the anacardic acid and the cardol; the ether is distilled off, and the residue after washing with water to free it from tannin, is dissolved in 15 to 20 times its weight of alcohol. This alcoholic solution is digested with recently precipitated oxide of lead, which removes the anacardic acid in the form of an insoluble lead salt. After repeated purification the acid is obtained as a white crystalline mass which melts at 26° C. It has no smell, but its flavour is aromatic and burning. When heated to 200° C. it is decomposed, producing a colourless very fluid oil. It burns with a smoky flame, emitting an odour like that of rancid fat. Alcohol and ether dissolve it readily, and these solutions redden litmus. Some of its salts are crystalline. Formula $C^{44} H^{64} O^{7}$, or $C^{44} H^{32} O^{7}$. After the removal of the anacardic acid the alcoholic solution which contains the cardol is distilled to recover the spirit, and water added to the remaining liquid till it becomes turbid, and afterwards acetate and subacetate of lead till it is decolorised; lastly, the lead is precipitated by sulphuric acid. Cardol is a yellow oily liquid, insoluble in water, very soluble in alcohol and ether; the solutions are neutral to litmus. This substance is not volatile, but decomposes when heated. It blisters the skin strongly. According to Stadeler it contains 60 % Carbon and 8·8 or 8·9 Hydrogen, whence he deduces the formula $C^{42} H^{31} O^{4}$; it should perhaps be $C^{21} H^{30} O^{2}$. (Confer. Stadeler, Ann., Ch., Pharm., lxiii. 137.)

The oil of the almonds is sweet, pale-yellow, sp. gr. 0·916; that of the mesocarp is thick, brown and viscid, sp. gr. 1·014; it reddens litmus, and turns darker when exposed to the air; it is soluble in alcohol and ether, and dyes linen of a permanent yellow-red. (Lepine.)

This oil was found by A. Basiner (1881) to be soluble in potassa, with a red colour, darkening on exposure, and its alcoholic solution to yield a red precipitate with basic lead acetate. Cazeneuve and Latour have found catechin in the wood of the Cashew tree.

Commerce.—Cashew nuts are imported into Bombay from Goa in very considerable quantities. Value—The Kernels, Rs. 18 per cwt.; the Tar, ¼ Re. per gallon in Goa.

Odina Wodier, *Roxb., Wight Ic., t.* 60; *Beddome Fl. Sylv., t.* 123; *Royle Ill., t.* 31. The bark and gum.

Vernacular.—Jingan (*Hind.*), Shimtí, Múi (*Bomb.*), Odiyamaram (*Tam.*), Jival (*Beng.*)

History, Uses, &c.—This tree is called in Sanskrit Jingini. I have not met with any notice of it in Hindu or Mahometan works on Materia Medica. Ainslie mentions that the bark powdered and mixed with Margosa oil is considered by the Vytians as a valuable application to old and obstinate ulcers; according to Wight the gum beaten up with cocoanut milk is applied to sprains and bruises, and the leaves boiled in oil are used for a similar purpose. In the Pharmacopeia of India the astringent properties of the bark are noticed, and its use as a lotion in impetiginous eruptions and obstinate ulcerations. A decoction of the bark is recommended by Dr. B. Bose as an astringent gargle. The tree is common in Bombay, but does not appear to be made any use of.

Description.—The gum is partly in tears of a yellowish tinge, and partly in colourless angular fragments, which are full of fissures like gum Arabic. It has a disagreeable taste and is not astringent, about one-half of it is completely soluble in water, the remaining portion forms a slimy mucilage, but is not gelatinous; the soluble portion, which is feebly acid, is precipitated by alcohol, and in a less degree by oxalate of ammonium, not at all by perchloride of iron or borax. The bark is very astringent, thick and soft, of a light brown colour externally, marked with numerous whitish scars, where portions of the dry suber have fallen off, also with many small scabrous rusty spots; internally it is white when fresh, but dries of a reddish brown, a gummy juice exudes from it when cut.

Microscopic structure.—The greater part of the bark consists of parenchymatous tissue, which contains hardly any starch; there are large laticiferous vessels which contain the gummy juice, and numerous concentric layers of woody tissue towards the inner part.

Semecarpus Anacardium, *Linn., Roxb. Cor. Pl. I., t.* 12; *Wight Ic., t.* 558; *Beddome Fl. Sylv., t.* 166. The fruit.

Vernacular.—Bhela, Bhilawa (*Hind.*), Bibba (*Bomb.*), Shén-kottai, Sherán-kottai (*Tam.*)

History, Uses, &c.—The marking-nut, in Sanskrit Bhallátaka and Arushkara, is regarded by the Hindus as acrid, heating, stimulant, digestive, nervine and escharotic, and is used in dyspepsia, piles, skin diseases, and nervous debility. It is prepared for internal use by being boiled with cowdung and afterwards washed with cold water. The nut is also used to produce the appearance of a bruise in support of criminal charges preferred through enmity,* and the juice is sometimes applied to the body out of revenge, the victim having first been made insensible by the administration of narcotics. In Sanskrit medicinal works a section is often devoted to the treatment of ulcerations thus produced. When given internally the juice of the pericarp is always mixed with oil or melted butter. The Arabic name for the nut is Hab-el-Kalb, an allusion to its heart-shaped form. Mahometan writers order the juice to be always mixed with oil, butter, or some oily seed when used for internal adminstration. They consider it to be hot and dry, useful in all kinds of skin diseases, palsy, epilepsy, and other affections of the nervous system, the dose being from ¼ to ½ a dirhem. Externally they apply it to cold swellings, such as piles; the Tuhfat notices the use of the vapour of the burning pericarp for this purpose, a practice which I have noticed in Bombay; it causes sloughing of the tumours. When too large a quantity has been taken, oily and mucilaginous remedies should be prescribed. Two dirhems is considered a poisonous dose. Some persons are much more readily affected by the drug than others. Garcia d'Orta remarks that the poisonous properties of the marking-nut have been much exaggerated by Serapion,† and goes on to say that in Goa it is administered internally in asthma after having been steeped in buttermilk, and is also given as a vermifuge; and moreover, says he, we (the Portuguese) salt the young green fruit and use them like olives. Ainslie gives the following account of its use in Southern India. The Hindus give the juice in scrofulous, venereal and leprous affections in very small doses; an oil is also prepared with the nut by boiling, which is used externally in rheumatism and sprains, it is of a very stimulating nature; undiluted it acts as a blister. The Telingoos have the following prescription:—Juice of marking-nut and garlic of each 1 ounce, juice of fresh tamarind leaves, cocoanut oil and sugar of each 2 ounces; mix, and boil for a few minutes. Dose—One table spoonful twice daily in syphilis, aches, sprains, &c. Mixed with a little quicklime and water the juice is used all over India for marking linen, and is far more durable than the marking inks of Europe.

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* Its application in a diluted form produces great œdematous swelling and redness of the skin.

† There seems to be little doubt that the Anacardium of Serapion, Rhazes and Avicenna was the marking-nut; the latter recommends it as a fumigation to hæmorrhoids.

In the Concan a single fruit is heated in the flame of a lamp and the oil allowed to drop into a quarter ser of milk; this draught is given daily in cough caused by relaxation of the uvula and palate. As an application to scrofulous glands of the neck equal parts of the juice of Bibba, Plumbago zeylanica (Chitrak), Baliospermum montanum (Danti-mul), Euphorbia nereifolia (Newarang), Asclepias gigantia (Rui mandar), sulphate of iron, and molasses are used. The juice of the root-bark is also used medicinally on account of its acrid properties.

The brown oil of the marking-nut appears to resemble very closely in its medical action that of the cashew-nut (see above). Basiner found that within 12 hours it raised a black blister; this should be carefully protected from touch, as the fluid causes eczematous vesicles on any part of the body it may come in contact with. Basiner has also noticed painful micturition, the urine being reddish brown and bloody, and painful stools as a sequel to the external application of the oil. (Am. Journ. Pharm., Mar. 1882, p. 131.) Like the oil of the cashew-nut, this oil appears to have a much less injurious effect than would be expected, when administered internally.

For the reasons above mentioned both oils are inconvenient for vesicating purposes.

Description.—The marking-nut is well described by the Arabs as resembling the heart of an animal, the torus representing the auricles, and the fruit the ventricles; in the dry commercial article the torus is seldom present, and the fruit is of the size and shape of a broad bean, of a black colour, and quite hard and dry externally, but upon breaking the outer skin with a knife, the central cellular portion of the pericarp will be found full of a brown oily acrid juice; inside the pericarp is a thin shell conforming to it, and containing a large flat kernel, which has no acrid properties. The root-bark is very thick and contains a large quantity of acrid juice similar to that found in the pericarp; it dries into a black varnish.

Chemical composition.—The almonds contain a small quantity of sweet oil; the pericarp contains 32 °/₀ of a vesicating oil of specific gravity ·991, easily soluble in ether, and blackening on exposure to the air. It is similar to that of Anacardium occidentale, but Basiner (1881) found that it dissolves in potassa with a green colour, and its alcoholic solution turns black with basic lead acetate.

Commerce.—Marking-nuts come from various parts of the country. Value, ¾ to 1 Rupee per Surat maund of 37½ lbs.

Spondias mangifera, *Willd.*, *Wight Ill. I.* 186, *t.* 76; *Bedd Fl. Sylv.*, *t.* 169. *Vernacular*—Amra (*Hind.*), Ambáda (*Bomb.*), yields a yellowish gum, principally in stalactiform pieces; placed in water it swells into a bulky almost tasteless jelly, a small portion is soluble; it appears to be of the nature of gum Arabic. The drupe of this tree is oval, fleshy, smooth, the size of a pullet's egg, and yellow when ripe; nut oblong, woody, very hard, outwardly fibrous, 5-celled, from 1 to 3 cells only are fertile; seed lanceolate; embryo inverse, without perisperm. The pulp is acid and astringent, and is considered useful in bilious dyspepsia. The fruit is the Hog plum of

Anglo-Indians, and is called Amrát in Sanskrit. The Hindus make a preparation of it called *Rayeté,** which much resembles Gooseberry Fool.

MORINGEÆ.

Moringa pterygosperma, *Gärtn., Wight Ill. I.* 186, *t.* 77 ; *Bedd. Fl. Syl., t.* 80. The fruit.

Vernacular.—Sahjna (*Hind.*), Shegva, Shegat (*Bomb.*), Murungai (*Tam.*)

History, Uses, &c.—The root of this very common tree, the Sobhanjana of Sanskrit writers, is described by the Hindus as acrid, pungent, stimulant, and diuretic, and is applied externally as a rubefacient. The seeds are said to be stimulant and are called Sveta maricha (white pepper). The Bhavaprakása mentions two varieties of the tree—*viz.*, white and red. The white is said to be the stronger rubefacient, but the red is preferred for internal use ; it is given in ascites arising from enlargement of the liver and spleen. In internal and deep-seated inflammation and abscess (vidradhi,) a decoction of the root bark is recommended to be given with the addition of asafœtida and rock salt. The root bark is besides used externally as a plaster, and the inflamed part fomented with its decoction. A decoction of the root bark is considered useful in calculous affections. The seeds are an ingredient in some stimulant applications. The gum of the tree, mixed with sesamum oil, is recommended to be poured into the ears for the relief of otalgia (*vide* Chakradatta in Dutt's Hindu Materia Medica). Mahometan writers describe Sahjna flowers as hot and dry, and consider that they expel cold humours, disperse swellings, act as a tonic and diuretic, and increase the flow of bile. The juice of the root with milk is diuretic, antilithic and digestive, and is useful in asthma. A poultice made with the root reduces swellings, but is very irritating and painful to the skin. The pods are a wholesome vegetable, and act as a preventive against intestinal worms (*vide* Makhzan, article Sahjna). Ainslie mentions the use of the Morunghy root by Europeans as a substitute for Horseradish. He also says that the native doctors prescribe it as a stimulant in paralytic affections and intermittent fever in doses of about one scruple; that they also employ it in epilepsy and hysteria, and consider it a valuable rubefacient in palsy and chronic rheumatism. He wrongly supposes the seeds to be the Hab-el-ban of the Arabians. According to Fleming, the oil of the seeds is used as an external application for rheumatism in Bengal. In Bombay the root is generally accepted by Europeans as a perfect substitute for Horseradish. The unripe pods are used as a vegetable; they may be boiled and served with melted butter, or cut in pieces and mixed with curries. The flowers are eaten in curries, and also fried with butter. The young leaves are boiled with onions and spices and used in the same manner. A decoction of the root bark is used as a fomentation to relieve spasm. In the Concan the bark of the wild tree is ground with Plumbago root, pigeon's dung, and chicken's dung and applied to destroy Guinea worms. Four tolás of the juice of the leaves of the cultivated tree are given as an emetic. The gum is said to be used to produce abortion, but it is difficult to obtain any reliable evidence upon a point of this nature; it would be quite possible to use it as a tent to dilate the os uteri, as it is very tough, and swells rapidly when moistened. In Bombay the right of collecting the pods upon Government lands is leased; they are never allowed to ripen, and the oil is not expressed. The Bengal Pharmacopœia furnishes formulæ for a compound spirit and compound infusion. In the Pharmacopœia of India the plant is placed in the secondary list, and its principal uses are briefly noticed.

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* रायतं A semi-fluid dish prepared with a little mustard, milk and the pulp of some acid fruit.

Description.—The fruit is light brown when ripe, a foot or more in length, triangular, ribbed, and composed of three valves containing a soft white pith, and a single row of from 12—18 seeds, which are dark brown, roundish, the size of a pea, and furnished with three membranaceous wings. The kernel is white, oily, and bitter. The gum, when it first exudes, is opaque and white; from exposure to the air it soon becomes pink, and finally of a dull red colour on the surface, the interior remaining white. It occurs in pieces of considerable size, and generally more or less vermicular in form. Placed in water it swells up and forms a salmon-coloured, firm, bulky jelly. The taste is mildly astringent. The bark of the root has a reticulated light brown external surface; it is thick, soft, and internally white, and has a pungent odour and taste, exactly like Horseradish. The wood of the root is soft, porous, and yellowish, and has the same properties in a less degree.

Microscopic structure.—The parenchyme cells of the bark are loaded with globules of essential oil. The wood is provided with very large scalariform vessels easily visible with the naked eye. The medullary rays both in the wood and bark are very distinct.

Chemical composition.—The root distilled with water yields an essential oil which appears to have much pungency, but the odour is distinct from that of oil of mustard and garlic, and more offensive. The husked seeds yield, according to Cloëz, 36·20 per cent. of oil. (Compt. Rend. LXI. p. 236.) D. Hooper has found that the astringency of the gum is due to the presence of moringo-tannic acid; it differs from bassorin in some particulars, and contains some arabin.

CONNARACEÆ.

Rourea santaloides, *Dalz.*, *Burm. Thes. Zeyl.*, *t.* 89. *Vern.*—Vardhárá (*Bomb.*) This is a climbing shrub; leaflets 2—4 pair, ovate, narrow, blunt acuminated, coriaceous, shining; panicles axillary and terminal, few flowered; fruit ovoid, pointed, rather fleshy. The leaves are like those of Santalum. (*Bombay Flora.*) The root, which is used medicinally, is knotted and twisted, of a brown colour, about the size of Belladonna root, and not unlike it in appearance; adhering to the cut surfaces is a quantity of dry dark-coloured latex; taste bitter. It is used as a bitter tonic in rheumatism, scurvy, diabetes, and pulmonary complaints. Many fanciful virtues are attributed to it by the natives; it is believed to promote the growth of a fœtus in utero, the development of which has been arrested.

LEGUMINOSÆ.

Trigonella Fœnum-Græcum, *Linn., Sibth. Fl. Græc., t.* 766; *Bentl. and Trim., t.* 71. The seed and herb.

Vernacular.—Méthi (*Hind., Bomb.* and *Beng.*), Vendayam (*Tam.*)

History, Uses, &c.—Fenugreek has a history of great antiquity; it was much valued by the ancients both as a food and medicine; in India it has long been extensively cultivated, its seeds being considered carminative, tonic, and aphrodisiac. Several confections made with them are described in Sanskrit works under the names of Methi modaka, Svalpa methi modaka, &c., and are recommended for use in dyspepsia with loss of appetite, in the diarrhœa of puerperal women, and in rheumatism. All these preparations consist of a number of aromatic substances, one part each, and fenugreek seeds equal in quantity to all the other ingredients. Under the Arabic name of Hulbah, Mahometan writers describe the plant and seeds as hot and dry, suppurative, aperient, diuretic, emmenagogue, useful in dropsy, chronic cough and enlargements of the spleen and liver. A poultice of the leaves is said to be of use in external and internal swellings and burns, and to prevent the hair falling off. The flour of the seeds is used as a poultice, and is applied to the skin as a cosmetic. They also use the oil of the seeds for various purposes. In Europe the history of the plant is equally ancient. Aretæus prescribed it both internally and externally. The powder of the seeds was recommended by Dioscorides in the form of a poultice for inflammatory affections.* Pliny mentions its various uses as a medicine. Ainslie notices its uses by native practitioners in Southern India for dysentery, the seeds being toasted and afterwards infused. At the present time, Fenugreek is extensively used in India both as an article of diet and as a medicine. The young plants are always to be found in the vegetable markets, and are most esteemed when only the two seed leaves are formed; they are boiled and afterwards fried in butter, the taste is strongly bitter, and disagreeable to those who have not become accustomed to it; in bilious states of the system the vegetable has an aperient action. The seeds form the basis of a medicinal confection extensively used by the natives. They also enter into the composition of an imitation of carmine. The yellow decoction used with sulphate of copper produces a fine permanent green. In the Concan the leaves are used both internally and externally on account of their cooling properties.

Description.—The pod is sickle-shaped, 3—4 inches long, slightly flattened and ending in a long point; it contains from 10—20 rhomboidal seeds, yellow or yellowish-brown, semi-transparent, about ⅛ of an inch long, somewhat compressed, with the hilum on the sharper edge, and a deep furrow running from it and almost dividing the seed into two unequal lobes; the surface is finely tubercular; the testa consists of two layers, the inner of which is mucilaginous and encloses the cotyledons and their large hooked radicle. The cotyledons are composed of parenchymatous tissue, the cells of which contain globules of fatty matter, and granular matter coloured yellow by iodine; there is no starch; the taste is bitter, oily and aromatic.

Chemical composition.—The cells of the testa contain tannin; the cotyledons a yellow colouring matter, but no sugar. The air-dried seeds give off 10°/° of water at 100° C., and on subsequent incineration leave 7°/° of ash, of which nearly a fourth is phosphoric acid. Ether extracts from the pulverised seeds 6°/° of a fetid, fatty oil, having a bitter taste. Amylic alcohol removes in addition a small quantity of resin. Alcohol added to a concentrated aqueous extract, forms a precipitate of mucilage, amounting, when dried, to 28 %. Burnt with soda lime, the seeds yielded to Jahns 3·4 % of nitrogen, equivalent to 22 % of albumin. The nature of the odorous principle has not been determined. (Pharmacographia, p. 151.)

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* It is the *τηλις* of Dioscorides (ii., 93.) and the Fœnumgræcum of Pliny, (18, 16). Other Greek names are *βούκερως*, (oxhorn) and *ἀιγόκερως*, (goatshorn).

Commerce.—Fenugreek seeds are imported into Bombay in large quantities, from Karachí, the Deccan, and Guzerat. From Karachí alone the imports are about 14,000 cwts. annually.

Value.—Karachí, Rs. 43 per candy; Ghâti, from the Ghauts and Deccan, Rs. 50 per candy; Korinár, from Guzerat, Rs. 45 per candy.

Melilotus hamosa, *Link.*, *Bux. Ce.* 2, *t.* 44, *f.* 1. The fruit.

Vernacular.—Iklil-el-Malik (*Arab.* and *Bomb.*)

History, Uses, &c.—The small crescent-shaped pods which are imported into Bombay from the Persian Gulf under this name are not those of M. officinalis, but are considered by Arabian writers to be the Melilotus of Dioscorides.* The author of the Makhzan-el-Adwiya gives Málilotus as the Greek name and Gíah-i-Kaisar as the Persian. He goes on to say that "there are two kinds of Melilot, both plants are much alike, but the fruit of one is crescent-shaped with small roundish seeds something like Fenugreek, while the fruit of the other is much smaller and only slightly curved; both have an odour like Fenugreek. The best fruit for medicinal purposes is hard, yellowish, white and aromatic, with yellow seeds." The Mahometans, following the Greeks, hold Melilot in high esteem as a remedy in a great variety of disorders; it is considered to be suppurative and slightly astringent, and is much used as a plaster to dispel tumours and cold swellings. The diseases in which it is administered internally are of a widely different nature and far too numerous for recapitulation here; for an account of them I must refer the reader to the Makhzan, article Iklíl-el-Malik. The Arabian drug appears to have the same properties as M. officinalis, at any rate it has the same peculiar coumarin odour. Melilotus alba, *Lam.*, and M. parviflora, *Desf.*, grow in the Bombay Presidency; the first species has the delicate odour of the European Melilot. In the Makhzan an Indian variety of Melilot is mentioned, which has very small fruit; it is called Pirang.* Coumarin, when given to dogs in doses of 7 to 10 grains, produces great and even fatal depression, and in man doses of 30 to 60 grains occasion nausea, giddiness, depression, vomiting and drowsiness.

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* *μελίλωτος*, Dios. iii., 43. Melilotos and Sertula campana of the Romans. Plin. 21, 11 and 21, 7, much used in preparing malagmata, Scrib. Comp. 258, et *seq.*

Description.—Small, sickle-shaped, greyish yellow pods with a beak slightly curved outwards, distance from base to apex ½ an inch; length of pod when straightened out about one inch; it is grooved on both sides, and divided by a central partition into two cells, each of which contains a single row of small greyish-yellow rhomboidal seeds, deeply notched on one side, and seen under the microscope to be marked with numerous black spots. The other kind with very small slightly curved pods mentioned by Mahometan writers is not found in the shops.

Chemical composition.—Coumarin, the odorous principle of Melilot, is found in several plants; it is best obtained from the Tonka bean by digesting in strong alcohol, on evaporating which a crystalline magma of it is obtained, which when purified with animal charcoal is colourless; it crystallizes in small rectangular plates, or in large prisms; melts at 50° C., and boils at 270° without sensible alteration; it has an agreeable aromatic odour, and burning taste, the vapour acts strongly upon the brain; coumarin is nearly insoluble in cold water, boiling water dissolves it freely, and deposits it on cooling in slender needles. It dissolves without alteration in dilute acids.

Commerce.—Iklil-el-Malik is sold for six annas per lb.

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* Trigonella corniculata, *Linn.*, *Wight Ic.*, *t.* 384. It is cultivated in Bengal as a vegetable in the cold weather; also at Belgaum, where it is called *Tirapa.*

Indigofera tinctoria, *Linn.*, *Wight Ic.*, *t.* 365; *Rheede Hort. Mal.*, *t.* 54. The plant and indigo.

Vernacular.—Níl (*Hind.*), Níl, Guli (*Bomb.*), Nílam (*Tam.*)

History, Uses, &c.—Indigo, in Sanskrit Níla, appears to have been known in the East as a dye and medicine from a very remote period. We find it mentioned by Pliny as Indicum,* and there is reason to believe that it was known in Egypt at a much earlier date, but the plant from which it was produced was not known in Europe until the close of the sixteenth century. Before the time when the English began to pay attention to the manufacture of this article, the best indigo made in India was known as Baiana, from the name of a place in the Shahjahanabad district where it was made. Both Hindus and Mahometans consider the plant to have attenuant properties; they prescribe it in whooping cough, affections of the lungs and kidneys, palpitation of the heart, enlargement of the spleen or liver and dropsy. Indigo applied to the navel of children is said to act upon the bowels; it is applied to the hypogastrium to promote the action of the bladder. A poultice or plaster of the leaves is recommended in various skin affections, and is used as a stimulating application to old ulcers, hæmorrhoids, &c. Indigo is applied to the bites and stings of venemous insects and reptiles to relieve the pain, also to burns and scalds. Ainslie notices the use of the root by the Hindus in Hepatitis. It would appear that the wild indigo (I. pauciflora, Delile,) is considered to have the same medicinal properties as I. tinctoria and its variety I. anil. For an account of Roth's observations on the use of Indigo in epilepsy and other spasmodic affections, see *Brit. and For. Med. Rev.*, July 1836, p. 244.

Cultivation and production.—Indigo is chiefly cultivated in Bengal in the delta of the Ganges, on those districts lying between the Hooghly and the main stream of the former river. The ground is ploughed in October and November after the cessation of the rains; the seeds are sown in March and the beginning of April. In July the plants are cut when in blossom, that being the time when there is the greatest abundance of dyeing matter. A fresh moist soil is the best, and about 12 lbs. of seeds are used for an acre of land. The plants are destroyed by the periodical inundations, and so last only for a single year. When the plant is cut it is first steeped in a vat till it has become macerated and has parted with its colouring matter; then the liquor is let off into another vat, in which it undergoes a peculiar process of beating to cause the fecula to separate from the water; the fecula is then let off into a third vat, where it remains some time, after which it is strained through cloth bags and evaporated in shallow wooden boxes placed in the shade. Before it is perfectly dry it is cut into small pieces an inch square; it is then packed up for sale. Indigo is one of the most precarious of Indian crops, being liable to be destroyed by insects as well as inundation of the rivers. It is generally divided into two classes, *viz.*, Bengal and Oude indigo. Madras indigo is not much inferior to that grown in Bengal. (Drury.)

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* Plin. 33,13; and 35, 6.

Description.—A shrub 2 to 3 feet, erect, pubescent; branches terete, firm; leaves pinnated; leaflets 5 to 6 pairs, oblong ovate, cuneate at the base, slightly decreasing in size towards the apex; racemes shorter than the leaves; sessile, many flowered; flowers small, approximated at the base of the raceme, more distant and deciduous towards the apex, greenish rose-coloured; calyx 5 cleft, segments broad, acute; legumes approximated towards the base of the rachis, nearly cylindrical, slightly torulose, deflexed and curved upwards; seeds about 10, cylindrical, truncated at both ends.

Chemical composition.—According to Chevreul (Ann. Chim., lxvi., 8; lxviii., 284) woad and other Indigo plants contain indigo white, $C^8 H^6 NO$, which contains 1 at. H more than indigo blue, and being held in solution by the sap is converted into indigo blue by oxidation, on exposure to the air.

$$2 C^8 H^6 NO + O = 2 C^8 H^5 NO + H^2 O.$$

This explanation being the simplest was very generally adopted, until Schunck (Phil. Mag. [4] XV. 29) pointed out that white indigo cannot exist in any plant since it requires free alkali for its solution, whereas the sap of plants is always acid, and moreover contains free oxygen. Schunck has further shown that woad contains indican, which is readily soluble in water, and when boiled with acids splits up into indigo-blue and indiglucin, without the intervention of oxygen.

$$\begin{array}{ccccccc} C^{26}H^{31}NO^{17} & + & 2H^{2}O & = & C^{8}H^{5}NO & + & 3C^{6}H^{10}O^{6} \\ \text{Indican.} & & \text{Water.} & & \text{Indigo-blue.} & & \text{Indiglucin.} \end{array}$$

The same substance probably exists in other indigofera, and in other plants from which indigo is obtained, and during the steeping process, already described, is resolved in consequence of the fermentation which takes place into indigo-blue and indiglucin.

Commerce.—There are many kinds of indigo in the Bombay market ; the principal are :—

Calcutta	Value	Re.	60	to	110	per maund	of 41 lbs.
Madras	„	„	40	„	105	„	„
Hawudí	„	„	55	„	66	„	„
Kheirpurí	„	„	38	„	50	„	„
Multanílál	„	„	35	„	50	„	„
Kánpúr	„	„	30	„	50	„	„
Deraní Jámpúr...	„	„	20	„	32	„	„

Indigofera enneaphylla, *Linn., Wight Ic., t.* 403 ; *Burm. Fl. Ind., t.* 55, *f.* 1. According to Ainslie the juice of this plant is given as an antiscorbutic, alterative, and diuretic.

Indigofera aspalathoides, *Vahl., Wight Ic., t.* 332; *Hook. Ic., t.* 188. The leaves, flowers, and tender shoots are said to be cooling and demulcent, and are employed in decoction in leprosy and cancerous affections. The root is chewed as a remedy for toothache and aphthæ. The whole plant rubbed up with butter is applied to reduce œdematous tumours. A preparation is made from the ashes of the burnt plant to remove dandriff from the hair. The leaves are applied to abscesses, and an oil is obtained from the root, which is used to anoint the head in erysipelas. (Ainslie, Rheede.) I have not seen either of these plants used in Bombay.

Indigofera trifoliata, *Linn.*, *Wight Ic.*, *t.* 314. The seeds. Wekaria (*Bomb.*) These seeds are oblong, less than 1-16th of an inch in length, polished, yellowish, and marked with dull red blotches; they taste like dried beans or peas, and are prescribed along with other mucilaginous drugs as a restorative.

Psoralia corylifolia, *Linn.*, *Burm. Fl. Ind.*, *t.* 49; *Bot. Mag.*, *t.* 665. The seeds.

Vernacular.—Bukchí, Babchí (*Hind.*), Bawachí (*Bomb.*), Karpo'-Karishi (*Tam.*)

History, Uses, &c.—Native works on Materia Medica describe the seeds as hot and dry, or according to some cold and dry, laxative, stimulant, and aphrodisiac. They are recommended in leprosy, and other chronic skin diseases which depend upon a vitiated state of the blood, and are given internally and applied externally as a plaster; they are also said to be useful in bilious affections and as an anthelmintic. Ainslie mentions their use in Southern India as a stomachic and deobstruent, and says that they are prescribed in lepra and other inveterate cutaneous affections. He gives Vakoochie as the Sanskrit name. Recently they have been extensively tried in Bombay by Bhao Daji and others as a remedy in leprosy, and I believe with some success. An oleature of Bawachí is prepared and sold by Messrs. Kemp and Co., of Bombay. The plant is a common weed in the Deccan and Bombay, and the seeds are used in the Concan in making a perfumed oil which is applied to the skin.

Dr. Kanny Loll Dey strongly recommends the oleo-resinous extract of the seeds diluted with simple unguents as an application in Leucoderma. He says:—"After application for some days the white patches appear to become red or vascular; sometimes a slightly painful sensation is felt. Occasionally some small vesicles or pimples appear, and if these be allowed to remain undisturbed, they dry up, leaving a dark spot of pigmentary matter, which forms as it were a nucleus. From this point, as well as from the margin of the patch, pigmentary matters gradually develope, which ultimately coalesce with each other, and thus the whole patch disappears. It is also remarkable that the appearance of fresh patches is arrested by its application."—(Phar. Journ., III. Ser., Sept. 24th 1881.)

Several species of Psoralia have been used medicinally in America, and have been found to act as gentle, stimulating, and tonic nervines. (Stillé and Maisch., Nat. Disp.)

Description.—The seeds are oblong and flattened, rough, dark brown, about 2 or 2½ lines in length; they have a faintly aromatic unctuous smell; and taste somewhat bitter.

Chemical composition.—The Psoralias appear to contain resin, volatile oil, tannin and a bitter principle, but have not been sufficiently analyzed. (Stillé and Maisch.)

Tephrosia purpurea, *Pers., Bert. Misc. xix.,* 9, *t.* 5; *Rheede Hort. Mal. i., t.* 55. The plant.

Vernacular.—Sarphúnkha (*Hind.*), Sarpunkha and Jangli Kulthi (*Bomb.*), Kolluk-káy-velai (*Tam.*), Bon-nil-gachh (*Beng*).

History, Uses, &c.—Native works on Materia Medica describe this plant as deobstruent and diuretic, useful in cough and tightness of the chest, bilious febrile attacks, obstructions of the liver, spleen, and kidneys; they recommend it as a purifier of the blood and for boils, pimples, &c. Mír Mohammad Husain describes the plant minutely, and mentions its use in combination with Cannabis Indica leaves (two parts of the former to one of the latter) as a remedy for bleeding piles, and with black pepper as a diuretic, especially useful in gonorrhœa. Ainslie says the root of Galega purpurea is prescribed by the native practitioners in decoction in cases of dyspepsia and tympanitis; this is the use generally made of it in Bombay. T. purpurea is a common weed in the rainy season. The whole plant is pulled up when the flowers begin to appear, and tied in bundles for sale; it appears to act as a tonic and laxative.

Description.—A shrubby, erect, much-branched plant about 2 feet high; leaves pinnated; leaflets 5 to 9 pairs with an odd one, the largest an inch long, and 3-10th of an inch broad, cuneate oblong; racemes peduncled, longer than the leaves; legumes slightly compressed, spreading, linear falcate, obtuse, with a short point; seeds 4 to 6 in each pod, small, kidney-shaped; testa mottled; cotyledons yellow. All parts of the plant are slightly bitter. The dried plant is always obtainable in the shops.

Alhagi Maurorum, *Desv., Jaub. & Spach. Ill., t.* 401. The plant and manna.

Vernacular.—The plant, Jawása (*Hind.* and *Bomb.*), Girikarmika (*Tel.*); the manna, Taranjabin.

History, Uses, &c.—This plant, called in Sanskrit Duralabha, and in Arabic Háj, or Algoul, is a native of the deserts of Egypt, Syria, Mesopotamia, Persia, and India as far south as the Concan, and has been supposed by some to be the Occhi of Pliny, and the ακάνθα εν Αρια or 'Khorasan Thorn' of Theophrastus.* Mahometan writers give Farákiyun or Áthariyun as the Yunáni names. In the hot season when all the smaller plants die it sends forth leaves and flowers. The generic name is derived from the Arabic Al-háju, which is pronounced by the Egyptian Arabs El-hágu. The plant is described in Sanskrit works as laxative, diuretic and expectorant, the thorny flower stalks and branches being the parts used. An extract obtainable by evaporating a decoction of the plant is called Yávasakará; it has a bitter sweet taste, and is used as a demulcent in coughs. There is no mention in Sanskrit books of manna being obtained from the plant; indeed none is produced upon it in India. The Hindus use the fresh juice as a diuretic, generally in combination with laxatives and aromatics. (Confer. Sarangadhara and Chakradatta.) In Mahometan works, under the names of Hāj and Khár-i-shutr, or camel thorn, a description of the plant will be found. It is considered to be aperient, attenuant and alexipharmic. A poultice, or fumigation with it is recommended to cure piles, the expressed juice is applied to opacities of the cornea, and is directed to be snuffed up the nose as a remedy for megrim. An oil is prepared with the leaves as an external application in rheumatism; the flowers are applied to remove piles. Ainslie notices the plant as one of the sources of manna. In the Bengal Dispensatory and Pharmacopœia of India it is also noticed on this account. Under the name of Taranjabín Mahometan writers describe the manna. Mír Mohammad Husain says that it is collected in Khorasán, Mawarunnahr, Kurjistán, and Hamadán by cutting the plant and shaking it in a cloth to separate the manna. An inferior kind is made by dissolving what still adheres in water and evaporating it to a suitable consistence. He describes it as aperient and chologogue, more digestible than ash manna, expectorant, a good purifier of the blood from corrupt and adust humours when given in diet drinks, such as barley water, &c.; diuretic, and with milk fattening and aphrodisiac. In Bombay fine clean white samples of Taranjabín are obtainable during the season of import (November to January), but unless very carefully preserved it soon spoils in the moist climate of the Western Coast, running together, and becoming a brown sticky mass. The dried plant is always obtainable under the name of Jawása, and the ripe fruit with manna adhering to it under the name of Taranjabín. In the Concan the plant is smoked along with Black Datura, Tobacco, and Ajwán seeds as a remedy for asthma.

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* *ἐν δὲ τῃ ’Αρία χώρα καλουμένη ἄκανθά ἐστιν ἐφ’ ἧς γίνεται δάκρυον ὅμοιον τῆ σμύρνη και τῆ ὄψει καί τῆ ὀσμῆ. τοῦτο δὲ ὅταν ἐπιλάμψη ὁ ἥλιος καταρρεῖ.*—*Hist. Plant.* iv. 4.

Description.—A low shrub, armed with copious subpatent hard pungent spines, ½ to 1 inch long; leaves simple, drooping from the base of the spines or branches, oblong, obtuse, rigidly coriaceous, glabrous; flowers 1 to 6, from a spine or on short pedicels; calyx glabrous 1-12th to 1-8th inch; corolla reddish, three times the calyx; pod, 1 inch long or less, falcate or straight, constricted between the seeds; seeds kidney-shaped, greenish grey, very hard.

Taranjabín occurs in white grains or small agglutinated masses, mixed more or less with the thorns, pods, and leaves of the plant; it has hardly any odour; the taste is saccharine and afterwards slightly acrid.

Chemical composition.—According to Villiers (Compt. Rend., lxxxiv., 35), Alhagi manna after being boiled with animal charcoal, and evaporated to a syrup crystallized after some months in small brilliant crystals, which on crystallization from alcohol formed large white crystals of the formula $C^{12} H^{22} O^{11} + H^2O$. It is dextro-rotatory, its power being + 94° 48′, or for the sodium flame, + 88° 51′. On boiling with an acid, it is converted into glucose, and its rotatory power is reduced to that of glucose, *viz.*, + 53. It then reduces Fehling's solution; nitric acid oxidizes it to mucic and oxalic acids. Its melting point is 140°. It is thus seen to be identical with Berthelot's melezitose. It crystallizes in monoclinic (clinorhombic) prisms. The mannite of Alhagi also contains cane sugar, which may be isolated by treating the mother liquor of the melezitose with alcohol, and adding ether till a slight precipitate is formed. Crystals of cane sugar are then deposited. The mother liquor acts like a solution of cane sugar containing dextro-rotatory foreign substances which are not fermentable with beer-yeast. (*Vide* Jour. Chem. Soc., April, 1877.)

Commerce.—The plant is collected in India. The manna is imported from Persia in skins and bags. Value, about 10 annas a pound.

Uraria picta, *Desv., Jacq. Ic., t.* 567. The plant.

Vernacular.—Dábrá (*Hind.*), Sankar-jata (*Beng.*), Prisniparni (*Bomb.*)

Description, Uses, &c.—The plant is supposed in this part of India to be an antidote to the poison of the Phúrsa snake (Echis carinata); it grows along the shady banks of water-courses, and blossoms towards the end of the rains. The stem is erect, shrubby and branched, 3 to 4 feet; leaves alternate, petioled, from simple to pinnate; leaflets, the lower or single, are generally oblong-ovate, two to three inches long, and one and a half broad, the leaflets of the compound leaves are linear-lanceolate, all are obtuse, entire, and beautifully clouded on the upper surface, below a little reticulated and downy; racemes terminal, erect, rigid, cylindric, hairy, bracts of the peduncles chaffy, permanent; those of the flowers lanceolate, two flowered, falling; flowers numerous, small, red; pedicels incurved after the flowering time; calyx, apices of the divisions incurved and bearded, legume white and shining, consisting of from three to six oval joints connected by a slender isthmus, the incurved form of the pedicels presses them so much against the rachis, that the form is with difficulty observed; seed kidney-shaped, 1-12th of an inch long, dull yellow.

Uraria lagopoides, *D. C., Burm. Fl. Ind.* 68, *t.* 53, *f.* 2; Prisniparni (*Sans.*), Dowla (*Bomb.*), Chákulia (*Beng.*), Pitvan (*Hind.*) is of interest as forming one of the ingredients of the Dasamúla already mentioned (*vide* Tribulus terrestris). On this account it is much used in Hindu medicine, but seldom alone. It is supposed to have alterative, tonic and anticatarrhal properties.

Description.—Stems densely cœspitose, woody, slender, pubescent; petiole ½ to 1 inch; leaflets many, of both kinds, obtuse, broadly rounded at the base, 1 to 2 inches long, glabrous above, finely downy below; heads always simple, very dense, 1 to 2, rarely 3 inches long, under 1 inch thick, bracts subpersistent, distinctly ciliated; pedicels densely crinite, not longer than calyx; calyx 1-6th to 1-5th of an inch, lower teeth setaceous, densely plumose, corolla scarcely exserted; joints 1 to 2, brown, polished, finely pubescent. (Hooker's "Flora of British India.")

Desmodium gangeticum, *D. C., Wight Ic.*, 271. The plant.

Vernacular—Sarivan (*Hind.*), Sálwan, Dáye (*Bomb.*)

History, Uses, &c.—This plant is of interest as being an ingredient of the Dasamula Kvatha so often mentioned in Sanskrit works; it is considered to be febrifuge and anticatarrhal. In the Dasamula it is placed among the five minor plants (see Tribulus terrestris), a decoction of these is directed to be used in catarrhal fever, cough and other diseases supposed to be caused by deranged phlegm. The five major plants are prescribed in fever and other diseases supposed to be caused by deranged air. The ten together are used in remittent fever, puerperal fever, inflammatory affections within the chest, affections of the brain and many other diseases supposed to be caused by derangement of all the humours. (For further information upon these points, consult Chakradatta.) The Sanskrit name is Sálparni.

Description.—Stems sub-erect, reaching 3 to 4 feet high, woody, slightly angular, clothed with short grey down upwards, leaflet oblong, usually 3 to 6 inches long, not more than $\frac{1}{2}$ to $\frac{1}{3}$ inch broad, rounded at the base, narrowed gradually to an acute point, thinly clothed beneath with adpressed gray hairs, not reticulate-venose; petiole $\frac{1}{2}$ to 1 inch, racemes copious, ascending, lateral and terminal, the latter sublax, 6 to 12 inch long, simple or with a few short ascending branches in the lower part; pedicels $\frac{1}{12}$ to $\frac{1}{4}$ inch ascending; bracts minute, setaceous calyx under $\frac{1}{12}$ inch, finely downy; teeth lanceolate; corolla $\frac{1}{8}$ to $\frac{1}{6}$ inch; pod falcate, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, $\frac{1}{12}$ to $\frac{1}{8}$ inch broad, 6 to 8 jointed, glabrescent, or clothed with minute hooked hairs. (Hooker's "Flora of British India.")

Abrus precatorius, *Linn., Rheede Hort. Mal. viii., t.* 39; *Bentl.* and *Trim., t.* 77. The seeds, root and leaves.

Vernacular.—Gunj, Ghungchi (*Hind.*), Gunza (*Bomb.*), Gundumani (*Tam.*), Chanoti (*Guz.*)

History, Uses, &c.—This plant is mentioned by Susruta and other Sanskrit writers, it must therefore have long been in use as a medicine among the Hindus; they describe two varieties, namely, red and white-seeded. The seeds are said to be poisonous, and are used internally in affections of the nervous system, and externally in skin diseases, ulcers, and as an application to fistulas to excite inflammatory action. The root is described as emetic. Examples of compound medicines containing the seeds, extracted from Sárangadhara, Chakradatta, and the Bhavaprakasa will be found in Dutt's Hindu Materia Medica, p. 152. Mahometan writers under the name of Ain-ed-dik (cock's eye) describe the seeds, and state that they are hot and dry, tonic and aphrodisiac. Their use by goldsmiths as a weight is alluded to in the following well-known Doha (couplet):—

> Soná kahe sunár se, "uttum mhári ját
> Kále munh ki ghungchi, aur tule hamáre sáth."

My rank is of the highest, said the gold to the goldsmith, shall I be weighed against that black-faced seed! Sloane, in 1700, appears to have been the first to suggest the use of Abrus root as a substitute for liquorice. Prosper Alpinus, who visited Egypt in 1592, only mentions the use of the seeds as beads, and states that they are sometimes eaten, but are very unwholesome; he calls the plant "abrus," a name probably of Coptic origin, but possibly derived from the Greek αβρος, pretty. Greek and Latin writers do not mention any plant bearing this name.

In the Concan singers chew the leaves of the white-seeded variety as a remedy for hoarseness; they are also chewed with cubebs and sugar to cure aphthæ of the mouth. In spermatorrhœa with bloody discharges, equal parts of the juice of white Abrus leaves and Henna leaves are rubbed with the root of Holostemma Rheedii, cummin and sugar and administered. Abrus seeds are said to have been used for centuries in Brazil as a popular remedy for granular lids and pannus, and attention was called to this practise in Europe in 1862, without apparently leading to any experiments with the drug. Ainslie says:—" This root, when dried, coincides so exactly with the liquorice root of the shops, that it is often sold for it in the bazaars in Bengal." Other writers repeat the same statement, one which I cannot confirm, as I consider the root to bear very little resemblance to liquorice either as regards appearance or qualities; as pointed out by Mr. Moidín Sheriff, the leaves are by far the sweetest part of the plant, and from them a tolerable extract may be made, but in Bombay, where true liquorice is obtainable in any quantity as an article of commerce, it would be much more expensive to collect them than to use liquorice. The Cattle Plague Commission, in their report dated 1870, remarked that a large proportion of the criminal cases of cattle-poisoning are effected through the agency of Abrus seeds. In 1873, Dr. Center drew special attention to this fact; and more extended inquiry showed that this practice was common throughout the greater part of India. The Chamár or 'Skinner' caste are the class who mostly practise this mode of poisoning, and although their object usually is to obtain a supply of hides, they have been known to use these seeds for the purpose of committing murder. These people prepare small spikes by soaking the seeds in water and pounding them, these are dried in the sun, oiled and sharpened upon a stone, so that when fixed in a handle they can be driven beneath the skin of an animal. They are called by the natives *sui* (needles) or *sutari* (awls). (Conf. Ann. Repts. of the Chem. Examiners of Bengal and N.-W. Provinces from 1874 up to date.) Recently MM. Sattler and de Wecker have directed attention to the fact that the seeds of Abrus precatorius used in the form of a cold infusion are capable of producing artificially a purulent inflammation of the conjunctiva, which can be advantageously used in ocular therapeutics. (Ophthalmie Jequiritique et son emploi clinique, Paris, 1883.) They as well as Mr. Cornil attribute the inflammation to a specific bacillus, but admit that the severity of the inflammation is directly proportionate to the strength of the infusion and to the number of applications—a fact in keeping with the known properties of chemical poisons, and quite inconsistent with the idea of bacterial invasion. The non-bacterial nature of the poison has been asserted by Solomonsen of Copenhagen and Neisser of Breslau, and by Warden and Waddell of Calcutta, independently (Friedlander's Fortschritte der Medicin, February 1st, 1884; The non-bacillar nature of Abrus-poison, Calcutta, 1884). Warden and Waddell, indeed, assert that the toxic effects of the seeds are due to the presence of a proteid substance, to which they give the name *Abrin*. The chief facts established by their experiments are these:—1*st*, there is absence of bacilli or their spores in the seeds; 2*nd*, unsterilised Abrus-infusion favours the growth of bacteria, but no special form of bacillus was found constantly in all the specimens, and all the bacilli and cocci found were innocent; 3*rd*, the local action of unsterilised infusion is usually accompanied by bacterial formation; but the bacteria found are of various kinds, and non-pathogenous. They enter the wound (1) in the injected fluid, or (2) from the syringe during the process of injection, or (3) afterwards, when the reduced vitality of the part allows the degenerated tissue to become invaded by bacteria from the air; 4*th*, the intensity of the topical application of the infusion of Abrus-seed, like that of other chemical irritants, depends upon the concentration and number of applications; 5*th*, the characteristic lesions are a profound alteration in the organised elements of the blood, and the occurrence of generalised minute hæmorrhages into the substance of most of the highly vascular tissues and viscera. The hæmorrhages appear to occur by diapedesis, without rupture of the capillary walls; 6*th*, with large doses, death occurs too rapidly to be attributable to bacterial invasion; and direct examination shows the complete absence of bacteria, both in the blood and at the seat of the hæmorrhagic extravasations; 7*th*, when bacilli are found in the blood, their presence is purely accidental, and they are non-pathogenous and non-specific; 8*th*, the blood of an animal killed by Abrus-poison is non-infective ; *9th*, varying doses produce definite effects, proportionate to the largeness of the dose, in the same manner as any other chemical poison; *10th*, exposure to a temperature of 60° C., a temperature too low to destroy bacteria, destroys the activity of the poison ; *11th*, one small dose of the poison confers no immunity against further inoculation. The *Abrin* separated by Warden and Waddell was evidently an impure substance, and yielded a high percentage of ash. When introduced into the system by inoculation, it acts like an infusion of Abrus seeds. Abrin is contained also in the roots and stems of the plant. The treatment recommended is similar to that for snake-bites.

Dr. E. Klein (Interim Report to Local Government Board on the relations of Septic to Pathogenic Organisms, March 21st 1884,) has confirmed the experiments of Messrs. Warden and Waddell, that the active agent in poisoning by Abrus precatorius is not a bacillus, but is, in all probability, a soluble ferment. The method of using Abrus seeds in granular lids and pannus is to apply an infusion several times a day until inflammation is set up, in about three days after this suppuration commences, and a kind of false membrane is formed, in about a fortnight the suppuration terminates and the cure should be complete, but in some cases injury to the cornea has been observed. (Centralbl. f. Therapie I., 200 and 335.) According to some authorities injury to the cornea does not take place unless there is previous ulceration. At the Will's Eye Hospital in Philadelphia an infusion of 9 grains to 1 oz. of water is used, 4 grains of Boric acid being added to prevent decomposition. (Stillé and Maisch., National Dispensatory, 1884, p. 2.)

Description.—Leaves 2 to 3 inches long, abruptly pinnated, leaflets 8 to 20 pair, linear oval, obtuse at both ends, glabrous or slightly hairy, membranous, deciduous, $\frac{3}{8}$ to $\frac{5}{8}$ of an inch long, and $\frac{1}{6}$ to $\frac{1}{5}$ of an inch broad, taste sweet and like that of liquorice. Seeds bright scarlet or white, polished, as large as a pea, the red have a large black spot at one end, average weight 1·75 grains. Purple, yellow and blue varieties are met with, but they are not common. Root long, woody, hard, and much branched, seldom more than $\frac{1}{4}$ inch in diameter. Cortical layer very thin, reddish-brown, wood yellowish-white; odour and taste acrid, hardly at all sweet.

Microscopic structure.—Within the middle zone of the bark is a layer of sclerenchymatous tissue. Liber fibres are scattered through the interior of the cortical tissue, but do not form wedge-shaped rays as in liquorice.

The seeds have been examined by Dr. D. D. Cunningham of Calcutta. (*Ind. Med. Gaz.*, 1882.) Proceeding from without inwards he found— 1*st*, a single layer of thick-walled, columnar cells containing colouring matter, each cell dilated peripherally, and in many cases having a slight basal bulbosity. The peripheral dilated portion was observed to be cut up into a number of more or less cuneate portions; 2*nd*, a thick stratum of small cells, with thick walls and irregular sinuous outlines; 3*rd*, a thick stratum of large thin-walled cells; 4*th*, a thin stratum of small also thin-walled cells; 5*th*, a stratum of elongated thin-walled cells; 6*th*, a stratum of thickened cells, two or three layers deep; 7*th*, a single row of minute thin-walled cells of more or less cubical contour; 8*th*, a stratum of thick-walled cells with dense yellowish, granular contents; 9*th*, a stratum of thickened, more or less parenchymatous cells, with mere traces of cavities or contents. The cotyledons are composed of large, thick-walled cells containing granular matter and oil globules. The central cavities of the cells communicate by a system of processes which pass through the cell wall and are met by similar processes from the neighbouring cells.

Chemical composition.—The concentrated aqueous infusion of Abrus root has a dark brown colour, and a somewhat acrid taste, accompanied by faint sweetness. When it is mixed with an alkaline solution of tartrate of copper, red cuprous oxide is deposited after a short time; hence we may infer that the root contains sugar. One drop of hydrochloric or other mineral acid mixed with the infusion produces a very abundant flocculent precipitate, which is soluble in alcohol. If the infusion is mixed with a very little acetic acid, an abundant precipitate is obtained, but is dissolved by an excess. This behaviour is similar to that of glycyrrhizin. The leaves contain a sweet principle similar to that of liquorice. (Pharmacographia, p. 165.)

The seeds have been examined by Dr. Warden, of Calcutta. In a preliminary physiological experiment, half a seed rubbed down with a small quantity of water and injected into the thigh of a full-grown cat, produced fatal effects within 24 hours. This is in accordance with what has already been shown to be a practise in some parts of India of using small spikes prepared by drying a paste of the powdered seeds for felonious cattle-poisoning, the spikes being fastened on to the end of a stick after the manner of a drover's goad. Dr. Warden has succeeded in isolating an acid, which he represents by the formula $C^{21} H^{24} N^{3} O^{4}$, and has named it *Abric acid.* He also obtained a small quantity of pungent volatile oil, but both these substances proved to be inert. Having observed that an opalescent haze speedily formed in the clear filtrate from a watery infusion of the seeds when exposed to the air, Dr. Warden was led to suspect that a proteid substance might be the poisonous principle. Having percolated the powdered seeds with chloroform, by which fatty matter, some abric acid and a yellow colouring principle were removed, he exposed the powder to the air to evaporate the chloroform, and repercolated with 40 per cent. alcohol to remove extractives, until the percolate was nearly colourless. The powder was then exposed to the air, and when free from alcohol, percolated with cold distilled water. The resulting percolate had only a slight yellow tinge, and was very faintly acid in reaction. The active principle was obtained from this percolate by precipitation with alcohol, and purified by repeated precipitation and solution in water, and subsequently dried over sulphuric acid. When dry it was of a very light slate colour. Dr. Warden has given the name *Abrin* to this proteid, which he has found to be a much more active poison than the powdered seeds. (Confer. the non-bacillar nature of Abrus-poison, p. 39, *et seq.*)

Commerce.—The seeds only are obtainable in the shops.

Mucuna pruriens, *D. C., Wight Ic., t.* 280; *Bentl. and Trim., t.* 78. Cowhage.

Vernacular.—Kiwachh (*Hind.*), Kuhilí (*Bomb.*), Punaik-kali (*Tam.*), Alkusi (*Beng.*)

History, Uses, &c.—The plant has long been used medicinally by the Hindus; according to Susruta the seeds are aphrodisiac. The Bhavaprakasa gives the following directions for their administration:—"Take of Mucuna seeds 32 tolás, boil them in 4 seers of cow's milk till the latter becomes thick. The seeds should now be decorticated and pounded, fried in ghi (clarified butter), and made into a confection with double their weight of sugar. The mass should then be divided into balls and steeped in honey. Dose about a tolá (180 grs.)" This preparation is said to be powerfully aphrodisiac. (Dutt's Hindu Materia Medica, p. 148.) Similar properties are ascribed to the seeds (Hab-el-kulai) in Persian works. In the Concan a paushtik for spermatorrhœa is made by powdering the seeds of Gorí Kuhili (cultivated mucuna) and Tribulus terrestris, the roots of Eriodendron anfractuosum and Asparagus adscendens, emblic myrobalans, Tinospora starch and sugar-candy in equal proportions; of this powder 6 massa with 2 tolás of ghi are given in cow's milk twice a day. The root is considered a nervine tonic, and is prescribed in paralysis. The Sanskrit names of the plant are Atmagupta, Kapikachhu, and Vánari. According to Ainslie, a strong infusion of the root, sweetened with honey, is given by the Tamil doctors in cholera. The use of the hairs of the Mucuna pod as a vermifuge to expel ascarides appears to have originated in the West Indies, no mention of such an employment of them being found in native Indian works.* They were introduced to the notice of English physicians by Bancroft about 1769, and were probably first used in India upon their admission into the Edinburgh and London Pharmacopœias (1783-1809). They are now official in the Indian Pharmacopœia, but are hardly ever prescribed in this country. Still there is a considerable demand for the article in the Bombay market for exportation to Europe, and it is supposed to be required for the preparation of some patent vermifuge.

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* In the Wanaushadi Prakásha, a Marathi work which describes the domestic remedies of the Concan, their use with gúr as an anthelmintic is mentioned, but as this work is of very recent date, the practice may have been introduced.

Description.—The pods are slightly curved like the letter S, 3 to 4 inches long, and contain from 4 to 6 seeds of a dark brown colour and of the shape of a kidney bean. The valves are covered with rigid brown hairs about $\frac{1}{10}$th of an inch long, which give rise to much irritation of the skin if handled.

Microscopic structure.—Most of the hairs consist of a single conical cell barbed near the point, but some of them are divided by partitions. Their action appears to be simply mechanical.

Chemical composition.—The hairs when treated with sulphuric acid and iodine assume a dark brown colour. Boiling solution of potash does not considerably swell or alter them. They are completely decolourised by concentrated nitric acid. (Pharmacographia, 2nd Ed., p. 190.)

Mucuna monosperma, *D. C., Wight in Hook. Bot. Misc. ii.*, 346, *Suppl.*, *t.* 12; *Wall. Pl. As. Rar. iii.*, 19., *t.* 236.

Vernacular.—Songárvi, Mothi-kuhili (*Bomb.*) A large, flat, nearly circular seed, with a rough, black testa, 1 inch or more in diameter, the whole of its convex margin is occupied by the hilum. It is used as an expectorant in cough and asthma, and is applied externally as a sedative (Peters). The seed is also eaten, especially by Brahmins, as a restorative when fasting, and as a vegetable.

The pods are semi-oval, obliquely plaited, one-seeded, and armed with formidable stinging hairs of a golden brown colour.

Erythrina indica, *Lam., Wight Ic., t.* 58; *Rheede Hort. Mal. vi., t.* 7.

Vernacular.—Pángra (*Hind.* and *Bomb.*), Pálitá mandár. (*Beng.*), Muráka (*Tam.*)

History, Uses, &c.—The Indian Coral tree, in Sanskrit Párijáta and Mándára, is very common in the Deccan, where it is used as a prop for vines; it is also one of the commonest trees in the Concan, where a variety with white flowers is met with. Wight states that the leaves and bark are used as a febrifuge. Káni Lál Dé, in a communication to the Calcutta Exhibition Catalogue, says:—"It is anthelmintic and useful as a collyrium in ophthalmia. The leaves are applied externally to disperse venereal buboes and to relieve pain in the joints." In the Concan the juice of the young leaves is used to kill worms in sores, and the young roots of the white-flowered variety are pounded and given with cold milk as an aphrodisiac. The tree has smooth grey bark, armed with black prickles; the leaves are ternate and deciduous after the rains; the flowers, which are bright scarlet, appear in March, when the tree is leafless.

Párijáta is supposed to flower in Indra's garden, an episode in the Puranás relates the quarrels of Rakmini and Satyabhami for the possession of the flowers which Krishna had stolen from the garden.

Butea frondosa, *Roxb., Cor. Pl.* 21, *t.* 21; *Bentl. and Trim.*, *t.* 79. The flowers, leaves, seeds and gum.

Vernacular.—Palás, Dhák (*Hind.*), Palás, Kákria (*Bomb.*), Porasan (*Tam.*)

The seeds, Palaspapra (*Hind.* and *Bomb.*), Murukkanvirai (*Tam.*); the gum, Palas-ki-gond (*Hind.*), Palasa-gonda, Khákar-na-gon (*Bomb.*), Murukkan-pishin, Palásha-pishin (*Tam.*)

History, Uses &c.—This tree, known to the English as bastard teak, has long been known to the Hindus as possessing valuable medicinal properties. In the Bhavaprakasa the use of the seeds of Palása as an aperient and anthelmintic is noticed; they are directed to be beaten into a paste with honey for administration. Sárangadhara also recommends them as anthelmintic. The use of the gum as an external astringent application is mentioned by Chakradatta; it is directed to be combined with other astringents and rock salt. He recommends this mixture as a remedy for pterygium and opacities of the cornea. The author of the Makhzan-el-Adwiya describes the leaves of Palás as very astringent, tonic, and aphrodisiac, and says that they are used to disperse boils and pimples, and are given internally in flatulent colic, worms and piles. The flowers are astringent, depurative, diuretic and aphrodisiac, especially the white variety (probably B. parviflora); as a poultice they are used to disperse swellings and promote diuresis and the menstrual flow. The seed is anthelmintic, and, combined with astringents and rock salt, as already mentioned, is used to remove white spots from the cornea. (Confer. Makhzan, article Palás.) Ainslie notices the use of the seeds by Tamil practitioners as an anthelminitic, in doses of a table spoonful and a half twice daily, both in cases of tapeworm and ascarides. He quotes Roxburgh's description of the gum and flowers, but remarks that the natives appear to make no use of either of them. From the Hortus Malabaricus, it appears that the bark is given in conjunction with ginger in cases of snake-bite. Dr. Sherwood informed Ainslie that a decoction of the seeds with nitre was prescribed in gravelly complaints by native practitioners. In Bombay at the present time the gum is much used as a substitute for kino by natives and Europeans with satisfactory results. I have tried the seeds as an anthelmintic, and am inclined to think favourably of them; they have an aperient action. When pounded with lemon-juice and applied to the skin they act powerfully as a rubefacient. I have used them successfully for the cure of the form of herpes known as Dhobie's itch. In the Concan a poultice of the flowers boiled in water is applied to the abdomen in difficult micturition, and two tolás of the water with nitre is given internally. Dr. Fancourt Willis informs me that the Arab horse-dealers put one seed into each feed of corn to keep their horses in condition.

Description.—The leaves are spreading and ternate, from 8 to 16 inches long, leaflets emarginate, or rounded at the apex, leathery above, shining and pretty smooth below, slightly hoary, entire, the pair are obliquely oval, from four to six inches long, and from three to four and a half broad, the exterior one obovate, and considerably larger than the lateral ones; the flowers are very large, papilionaceous, their ground colour a beautiful deep red, shaded with orange and silver-coloured down; seed flat, about 1½ inch long, 1 inch broad, and 1-16th inch thick; testa dark reddish brown, thin, smooth, veined, hilum prominent; cotyledons large and leafy, surface veined, radicle small, taste a little acrid. The gum occurs in commerce as small, flattish or angular fragments of a very deep ruby colour, and unless held between the eye and the light seems to be opaque; it is mixed with numerous small particles of light grey corky bark; the taste is purely astringent. Butea superba and parviflora also yield a similar gum.

Chemical composition.—According to Hanbury gum Butea yield 1·8 % of ash, and contains 13·5 % of water. Ether removes from it a small quantity of pyrocatechin. Boiling alcohol dissolves it to the extent of 46 %; the solution which is but little coloured produces an abundant greyish green precipitate with perchloride of iron, and a white one with acetate of lead. It may be hence inferred that a tannic acid, probably kino-tannic acid, constitutes about half the weight of the drug, the remainder being a soluble mucilaginous substance. Butea kino submitted to dry distillation yields pyrocatechin. According to Eissfeldt it does not contain pyrocatechin, but yields it on dry distillation.

Roxburgh states that he obtained an extract by evaporating the juice of the flowers diluted with alum water and rendered clear by depuration, which proved a brighter water colour than gamboge. He further says that infusions of the dried flowers yielded an extract very little, if any thing, inferior to that made from the fresh juice. These extracts after being kept for a year remained perfectly bright. The oil of the seeds is yellow, sp. gr. 0·917; it is nearly tasteless, and solidifies at 10°. (Lepine.) The seeds also contain a bitter principle which has not been examined.

Commerce.—The gum and seeds are articles of commerce. Value, gum, 3 as. per lb. ; seeds, Rs. 2½ per maund of 37½ lbs.

Butea superba, *Roxb., Cor. Pl.* 23, *t.* 22.

Vernacular.—Tiwat, Tiwas, Palás-wél (*Bomb.*)

Description, Uses, &c.—A scandent shrub very closely resembling B. frondosa, and like that plant yielding a kino-like gum. As a remedy for the poisonous bites of animals the people of the Concan use the root with an equal proportion of the root of Nyctanthes and Woodfordia floribunda, the seeds of Cassia tora and Vernonia anthelmintica, and the stemjuice of Trichosanthes palmata made into a paste with cow's urine, as a local application, and administer Aristolochia indica internally. In the heat eruptions of children the leaf-juice is given with curds and yellow zedoary.

Pueraria tuberosa, *D.C., Wight Ic., t.* 412.

Vernacular—Bidari-kand, Bilai-kand (*Hind.*) is pretty common in the neighbourhood of Bombay. The root is an immense tuber, and has acrid properties; it is said by Roxburgh to be used as a cataplasm to reduce swellings of the joints. I have not seen it used in Bombay. The following description of the plant is given in Hooker's "Flora of British India" :—" Stems shrubby, the branches finely grey downy. Stipules minute, deciduous, cordate-ovate ; leaflets membranous, roundish, ½ to 1 ft. long, green, glabrescent above, densely clothed with whitish adpressed hairs beneath ; flowers in dense, virgate, leafless, often panicled racemes, reaching 6 to 9 inches long ; pedicels very densely fascicled ; calyx ⅙ to ¼ in. long, densely silky ; corolla short, blue, not quite twice the calyx ; limb of standard orbicular, distinctly spurred ; pod 2 to 3 inches long, membranous, flat, 3 to 6 seeded, clothed with long grey silky bristly hairs." Daree and Goomodee are given by Drury as the Telegu names.

O'Shaughnessy states that it is a native of the Circar mountains and the Punjab, and that the bruised root is used as a poultice to swellings of the joints. Cleghorn states that the tubers are exported to the plains. The Punjab names are Siali and Sural."

Clitorea ternatea, *Linn.*, *Bot. Mag.*, *t.* 1542. The root and seeds.

Vernacular.—Kálizer, Kava-thenthi (*Hind.*), Kájalí, Gokaran (*Bomb.*), Kakkanan-kodi (*Tam.*)

History, Uses, &c.—Sanskrit works on Materia Medica describe the root of Aparajita as aperient and diuretic, and direct it to be used in combination with other diuretics and laxatives in ascites and enlargements of the abdominal viscera. The Mahometans have given it the name of Mazeriyun-i-Hindi (Indian Mezereon) on account of its purgative and diuretic properties. I may mention here that Mazeriyun is used by them to remove dropsical enlargements of the abdomen. Ainslie mentions the use of the root in croup, given with the object of causing nausea and vomiting. In the Concan two tolás of the root-juice is given in cold milk to remove the phlegm in chronic bronchitis ; it causes nausea and vomiting. The juice of the root of the white flowered variety is blown up the nostrils as a remedy for hemicrania. The authors of the Bengal Dispensatory after extensive experiments deny its emetic properties, but say that an alcoholic extract proved a brisk purgative in doses of from 5 to 10 grains ; they found it however to give rise to griping and tenesmus, and do not recommend its use. Mr. Moidín Sheriff speaks highly from personal experience of the root bark in doses of from one to two drachms in infusion as a demulcent in irritation of the bladder and urethra. It acts at the same time as a diuretic, and in some cases as a laxative. The seeds appear not to have been used medicinally by the natives, but recently attention has been drawn to their purgative properties in the Pharmacopœia of India, and there would seem to be but little doubt that their action is mild and safe; they should be administered in combination with twice their bulk of acid tartrate of potash and a little ginger, and in the same doses as compound jalap powder. The seeds were first brought to England from the island of Ternate, one of the Moluccas, hence the specific name of the plant. Haines has recommended a syrup of the deep blue flowers as a colouring agent, and a tincture as a substitute for litmus.

Description.—The fresh root is white, fleshy, branched and spreading, often one inch or more in diameter, it has an acrid bitter taste. The root bark is soft and thick and easily separated; under the microscope it is seen to consist of a thin-walled cellular tissue containing a little granular matter; and here and there a few small starch cells. The central portion of the root is composed of very large dotted vessels easily visible to the naked eye. The seeds are rather more than 2-8ths of an inch long and resemble vetch seeds; they are mottled green and black. The testa is hard and contains two cotyledons made up of elongated thin-walled cells full of large starch granules; they have an acrid, bitter taste.

Chemical composition.—The seeds exhausted by spirit yield a light brown soft resin with a strong jalap odour.

Commerce.—The dried root is to be found in the shops sometimes.

Dalbergia sympathetica, *Nimmo, Jour. Linn Soc. IV., Suppl.* 42. The leaves.

Vernacular.—Pentgul (*Bomb.*), Titábli (*Goa*).

Description, Uses, &c.—The leaves of this plant are used in Goa as an alterative. It is a very remarkable scandent shrub; the stem studded thickly with large blunt thorns, often nine inches long, some of them contorted so as to assist in supporting it upon high trees; the leaves are pinnate, 4 to 6 inches long, the leaflets delicate, obtuse or emarginate, ½ to 1 inch long, thinly silky at first, especially beneath; the flowers are in short, axillary cymes; calyx 1-12th of an inch long, silky, with a pair of small obtuse, adpressed bracteoles; teeth short, obtuse; corolla twice the length of the calyx, yellowish white; pod generally one-seeded, membranous, obtuse, about 2 inches long and ¾ of an inch broad with an unusually short stalk. The plant is common on the hills near Bombay, and the bark is used as a *lép* to remove pimples. The foliage resembles that of the Tamarind, and is eaten by cattle. The flowers appear in February and March. Rheede's name for the plant is Ana Mullu.

In the Concan the juice of the leaves of D. volubilis, Roxb., *Vern.*—Alei, is applied to aphthæ, and used as a gargle in sore throat. The root-juice with cummin and sugar is given in gonorrhœa.

Pterocarpus santalinus, *Linn. fil., Bedd. Fl. Sylv., t.* 22; *Bentl. and Trim., t.* 82. The wood.

Vernacular.—Ragat-chandan, Lál-chandan (*Hind.*), Rakta-chandan, Ratánjlí (*Bomb.*), Shen-shandanam (*Tam.*)

History, Uses, &c.—According to Sanskrit writers there are three kinds of sandalwood, Srikhanda or white, Pitachandana or yellow, and Raktachandana or red. The first two are the dark and light-coloured wood of Santalum album. Upon the subject of red sandalwood Dutt (Materia Medica of the Hindus, p. 154,) has the following remark:—"It has been a question how the wood of Pterocarpus santalinus, which is nearly inodorous, came to be called by the name of Raktachandana in Sanskrit and the vernaculars of India. I am inclined to think that it is owing to the similarity in the uses to which the Hindus put both these articles. Both sandalwood and red sandalwood are rubbed on a piece of stone with water, and the emulsions used after bathing and in religious services." Hindu physicians consider red sandalwood to be astringent and tonic; they use it as a cooling application to inflamed parts and to the head in headache; as an external application it is supposed to be more powerful than white sandalwood, given internally to be less, so the two are often combined, and are considered to have similar properties. Mahometan writers follow the Hindus in describing the three kinds of sandalwood and their uses. The author of the Shafa-el-askam says that in bilious fluxes white sandal is used, when blood is being passed red sandal, and when the stools contain both bile and blood the two woods are combined. This treatment must be based upon the doctrine of signatures. Red Sanders wood is mentioned by Ainslie and the authors of the Bengal Dispensatory, but no further information regarding its uses in India is to be gathered from either work.

Description.—The wood sinks in water ; it is dark red with black veins ; thin shavings appear blood red with veins of a lighter tint if the section is a transverse one. The cells of the parenchymatous layers which connect the vascular bundles contain very large crystals of oxalate of lime visible to the naked eye ; all parts of the wood are full of colouring matter.

Chemical composition.—The following account of it is taken from the Pharmacographia :—" Cold water or fatty oil (almond or olive) abstracts scarcely anything from the wood, and hot water but very little ; on the other hand ether, spirit of wine, alkaline solutions, concentrated acetic acid, readily dissolve out the colouring matter. Essential oils of bitter almond or clove take up a good deal of the red substance ; that of turpentine none at all. This resinoid substance termed santalic acid or santaline is said to form microscopic prismatic crystals of a fine ruby colour, devoid of odour and taste, fusing at 104° C., insoluble in water but neutralising alkalis, and forming with them uncrystallizable salts."

Weidel (1870) exhausted the wood with boiling water, containing a little potash, and obtained by means of hydrochloric acid a red precipitate, which was redissolved in boiling alcohol and then furnished *colourless* crystals of Santal, $C^8 H^6 O^3$. They are devoid of odour or taste, not soluble in water, benzol, chloroform, bisulphide of carbon, and but sparingly in ether. Santal yields with potash a faintly yellow solution which soon turns red and green. The wood afforded Weidel not more than 3 per mille of santal. Cazeneuve (1874) mixed 4 parts of the wood with 1 part of slaked lime, and exhausted the dried powder with ether containing a little alcohol. After the evaporation of the ether, a small amount of colourless crystals of Pterocarpin was obtained, which were purified by recrystallization from boiling alcohol. They melt at 83° C., and are abundantly soluble in chloroform, in bisulphide of carbon, very little in cold alcohol, not at all in water. Pterocarpin agrees with the formula $C^{17} H^{16} O^{5}$. It yields a red solution with concentrated sulphuric acid, and a green with nitric acid 1·4 sp. gr. By submitting it to destructive distillation pyrocatechin appears to be formed. Franchimont (1879) assigns the formula $C^{17} H^{16} O^{6}$ to another principle of Red Sanders Wood, which he isolated by means of alcohol. It is an amorphous substance, melting at 105°. By extracting the wood with a solution of carbonate of sodium, Hagenbach (1872) obtained a fluorescent solution. Red Sanders Wood yielded us of ash only 0·8 per cent. (Pharmacographia, 2nd Ed., p. 20.)

Commerce.—Red sandalwood comes from Southern India, the felling of the trees is under Government control, and they yield a considerable revenue. It is imported into Bombay from Calcutta and the Malabar Coast. Value, Rs. 15 to 28 per kandy of 7½ cwts. The variation in price depends upon the quantity in the market.

Pterocarpus marsupium, *Roxb., Cor. Pl. ii., t.* 116; *Bedd. Fl. Sylv., t.* 21; *Bentl. and Trim., t.* 81. The gum.

Vernacular.—Bijísar (*Hind.*), Bíbla, Hûní, Asán (*Bomb.*), Vengai-maram (*Tam.*) The gum, Kamarkas (*Hind.*), Chinia-gond (*Bomb.*)

History, Uses, &c.—Neither Sanskrit or Mahometan medical works appear to contain any notice of this substance. Ainslie notices its use by the natives on the Coromandel Coast for toothache, but does not call it kino, and it would appear not to have been an article of export to Europe in his time. From the Pharmacographia we learn that kino originally came from the river Gambia in West Africa under the name of Gummi rubrum astringens Gambiense, and that it was produced by a tree called in the Mandingo language Kano, and which was afterwards identified with the Pterocarpus erinaceus of Poiret. In the Edinburgh Dispensatory of 1803 kino is described as coming from Africa and Jamaica, but in the 1811 edition, Duncan says that the African drug is no longer to be met with, its place being supplied by kinos from Jamaica, the East Indies, and New South Wales. After this date the East Indian drug appears to have been principally used, and when Wight and Royle (1844-46) proved its botanical origin it became recognised as the legitimate kino of the principal Pharmacopœias of Europe. A description of its collection on the Malabar Coast will be found in the Pharmacographia. In the Canara District of the Bombay Presidency it is collected in little cups made with leaves, and consequently assumes the form of concavo-convex cakes, 3 to 4 inches in diameter; these are always broken up and garbled by the wholesale dealers. Malabar kino is mostly reserved for the European market, there is little demand for it in native practice, Dragon's blood taking its place. The bark of the tree is used in Goa as an astringent, but the gum is not collected. Kino is more lenitive than other astringents, in consequence, probably, of the pectin it contains; it is chiefly used in the treatment of diarrhœa and pyrosis. (Stillé and Maisch.)

Description.—Kino as offered for sale is in blackish-red angular fragments full of cracks. If a thin fragment is held between the eye and the light it is seen to be of a rich garnet colour. The greater part of it is soluble in cold water and all in boiling water, but a portion is deposited on the water cooling. Rectified spirit dissolves kino, forming a deep red tincture which often gives trouble by becoming gelatinous if kept for any time. The addition of a little glycerine will prevent this.

Chemical composition.—The following account is extracted from the Pharmacographia :—" Cold water forms with kino a reddish solution, which is at first not altered if a fragment of ferrous sulphate is added. But a violet colour is produced as soon as the liquid is cautiously neutralized.

"This can be done by diluting it with common water (containing bicarbonate of calcium) or by adding a drop of solution of acetate of potassium. Yet the fact of kino developing an intense violet colour in presence of a protosalt of iron, may most evidently be shown by shaking it with water, and iron reduced by hydrogen. The filtered liquid is of a brilliant violet, and may be evaporated at 100° without turning green; the dried residue even again forms a violet solution with water. By long keeping the violet liquid gelatinizes. It is decolorized by acids, and turns red on addition of an alkali, whether caustic or bicarbonated. Catechu, as well as crystallized catechin, show the same behaviour, but these solutions quickly turn green on exposure to air.

"Solutions of acids, of metallic salts, or of chromates produce copious precipitates in an aqueous solution of kino. Ferric chloride forms a dirty green precipitate, and is at the same time reduced to a ferrous salt. Dilute mineral acids or alkalies do not occasion any decided change of colour, but the former give rise to light brownish red precipitates of kino-tannic acid. By boiling for some time an aqueous solution of kino-tannic acid, a red precipitate, kino-red, is separated.

"Kino in its general behaviour is closely allied to Pegu catechu, and yields by similar treatment the same products, that is to say, it affords pyrocatechin when submitted to dry distillation, and protocatechuic acid together with phloroglucin when melted with caustic soda or potash.

"Yet in catechu the tannic acid is accompanied by a considerable amount of catechin, which may be removed directly by exhaustion with ether. Kino, on the other hand, yields to ether only a minute percentage of a substance, whose scaly crystals display under the microscope the character of pyrocatechin, rather than that of catechin, which crystallizes in prisms.

The crystals extracted from kino dissolve freely in cold water, which is not the case with catechin, and this solution assumes a fine green if a very dilute solution of ferric chloride is added, and turns red on addition of an alkali. This is the behaviour of catechin as well as of pyrocatechin; but the difference in solubility speaks in favour of the crystals afforded by kino being pyrocatechin rather than catechin.

"We thought pyrocatechin must also occur in the mother-plant of kino, but this does not prove to be the case, no indication of its presence being perceptible either in the fresh bark or wood. Etti (1878) extracted from kino colourless prisms of kinoïn by boiling the drug with twice its weight of hydrochloric acid, about 1·03 sp. gr. On cooling kino-red separates, very little of it remaining in solution together with kinoïn. The latter is extracted by exhausting the liquid with ether, which by evaporation affords crystals of kinoïn. They should be recrystallized from boiling water; they agree with the formula $C^{14} H^{12} O^{6}$, which is to be regarded as that of a methylated gallic ether of pyrocatechin, *viz.*, $C^{6} H^{4} (OCH^{3}) C^{7} H^{5} O^{5}$. Kinoïn by heating it to 130° C. gives off water and turns red; $2C^{14} H^{12} O^{6} = O H^{1} C^{28} H^{22} O^{11}$. The latter product is an amorphous mass agreeing with kino-red; by heating it at 160 to 170° it again loses water, thus affording another anhydride. Etti succeeded in preparing methylic chloride, pyrocatechin, $C^{6} H^{4} OH)^{2}$, as well as gallic acid, $C^{7} H^{6} O^{5}$, by decomposing kinoïn.

"We have prepared kinoïn from Australian kino, but failed to obtain it from Malabar kino, which Etti says he used. Kino affords about 1½ per cent. of kinoïn. The solutions of kinoïn turn red on addition of ferric salts. Commercial kino yielded us 1·3 per cent. of ash." (Pharmacographia, 2nd Ed., p. 196.)

Commerce.—Kino is collected on the Malabar Coast, and exported from Cochin; it is seldom seen in the Bombay market.

Pongamia glabra, *Vent. Jard. Malm., t.* 28; *Wight Ic., t.* 59; *Bedd. Fl. Sylv., t.* 177. The oil, seeds, and leaves.

Vernacular.—Karanj, Kiramâl (*Hind.* and *Bomb.*), Pungam-maram (*Tam.*)

History, Uses, &c.—A very common tree in the Concan and also all over India, mentioned by Sanskrit writers for the medicinal properties of its seeds, leaves, and oil, which are used in skin diseases and rheumatism as external applications. (For original prescriptions see Chakradatta in Dutt's Materia Medica of the Hindus.) The Sanskrit names are Karanja and Nactamâla. A poultice of the leaves is a popular application to foul ulcers; the seeds and oil are generally made into a paste for application. Ainslie says that the juice of the root is used for cleaning foul ulcers, and closing fistulous sores. He also notices the oil and its use in itch and rheumatism. Gibson speaks very highly of the oil as a remedy in scabies, herpes, and other cutaneous diseases of a similar nature; it should be mixed with an equal quantity of lime or lemon juice and well shaken, when it forms a rich yellow liniment which I have used successfully in Porrigo capitis, pityriasis and psoriasis; in obstinate case Hydrocarpus oil, camphor and sulphur may be added with advantage. For destroying worms in sores the juice of the Karanj, Nim and Nirgondi is in common use. In leprosy the leaves of the Karanj and Chitrak mixed with pepper and salt are powdered and given with curds. Karanj is also an ingredient in several complicated prescriptions for epilepsy and abdominal enlargements which are too long to be reproduced here. In the neighbourhood of Bombay the oil is much used for burning by the country people. The seeds are collected in December, and taken to the oil mill for extraction. Five pahlis (about 20 lbs.) are sufficient for one ghanna or charge. For every such quantity the oil-man returns five seers of oil, keeping about 1 seer and the cake as payment for his work. If the seeds are brought ready ground to the mill about 6 seers of oil are given to the customer, and the cake only kept to pay for extraction.

Description.—Leaves pinnate from 6 to 18 inches long, leaflets opposite, 2 to 3 pairs and an odd one, oval, pointed, entire, smooth, and shining, subcoriaceous, 2 to 4 inches long, taste bitter; pod woody, ovate, compressed, glabrous, $\frac{1}{8}$ to $\frac{1}{4}$ inch thick, $1\frac{1}{2}$ to 2 inches long, apex thick and blunt, point decurved, very short, it generally contains one perfect and one abortive seed; seed compressed, of the shape and size of a broad bean; testa thin, smooth, veined, light-red; cotyledons very oily; oil bitter, pale sherry-coloured, below 60° F. it solidifies. According to Lepine (J. Pharm. [3] xl. 16.) the seeds yield 27 °/o of a dark yellow oil, having a specific gravity of 0·945, and solidifying at 8° C.

Glycyrrhiza glabra, *Linn.*, *Bentl. and Trim.*, *t.* 74.

Vernacular.—Mulatthi, Jethi-madh (*Hind.*), Jeshtimadh (*Bomb.*), Ati-maduram (*Tam.*)

History, Uses, &c.—This root, in Sanskrit called Yashtimadhu and Madhuka, though not indigenous, must have been known to the Hindus from a very early date, as it is mentioned by Susruta. Hindu works describe it as demulcent, cooling and useful in cough, hoarseness, &c. It is also recommended as a flavouring agent, and enters into the composition of many external cooling applications In Arabic and Persian works liquorice root is called Sús and Mehak, in some parts of Persia it is known as Mazhú. The author of the Makhzan-el-Adwiya gives a lengthy description of the plant, and directs the root to be decorticated before it is used. He says that the Egyptian is the best, next that of Irak, and then Syrian. The root is considered hot and dry, and suppurative, demulcent and lenitive, relieving thirst and cough, and removing unhealthy humours, also diuretic and emmenagogue, useful in asthma and irritable conditions of the bronchial passages. Sheik-el-Ráis recommends the decoction in cold colic; it is also dropped into the eyes to strengthen the sight.* A poultice made of the leaves is said to be a cure for scald head, and stinking of the feet or arm pits. Muhammad bin Ahmad and Yohanna bin Serapion recommend the seeds as being the most active part of the plant, but remark that they are only produced in certain climates (*e.g.*, Basra). In Persia glass bottle-makers use the wood for melting their materials, as they say it gives a greater heat than any other kind of fuel. Liquorice is cultivated at the present time in Persia, Sind, and about Peshawur. We have no particulars of the method of cultivation employed. Karachí liquorice is considered the best kind in the Bombay market. For an account of the history and cultivation of liquorice in Europe the Pharmacographia may be consulted.

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* Conf. Dios. *περὶ γλυκύῤῥιζης* iii., 5; and Plin. 22, 9, and 11, 54. Celsus 5, 23, calls it Dulcis radix.

Description.—Karachí liquorice root varies much in size, the largest pieces being 2 inches or more in diameter, and about 4 or 5 inches long, with the bark on; the wood is of a bright yellow colour, tough and fibrous. The taste is sweet at first, afterwards a little acrid and bitter The root is heavy and sinks in water.

Microscopic structure.—Commencing from the exterior the bark shows from 8 to 10 rows of closely packed brown tabular cells, then a cellular zone loaded with starch, next we meet with the expanded ends of the medullary rays which gradually become narrower towards the woody part of the root, between them are pyramidal bundles made up of a parenchyme consisting of transverse cells and small bundles of liber cell with thick walls. The wood is traversed by large medullary rays continuous with and having the same structure as those in the bark. The woody columns are made up of large fenestrated vessels and bundles of wood cells, between which portions of parenchyme continuous with that of the medullary rays here and there intrude.

Chemical composition.—According to Flückiger and Hanbury (Pharmacographia, p. 158), liquorice root contains in addition to sugar and albuminous matter, a peculiar sweet substance named glycyrrhizin, which is precipitated from a strong decoction upon addition of an acid or solution of cream of tartar, or neutral, or basic acetate of lead. When washed with dilute alcohol and dried, it is an amorphous yellow powder, having a strong bitter-sweet taste and an acid reaction. It forms with hot water a solution which gelatinizes on cooling, does not reduce alkaline tartrate of copper, is not fermentable, and does not rotate the plane of polarization. From the analysis and experiments of Gorup-Besanez (1861), it appears that the most probable formula of glycyrrhizin is $C^{24} H^{36} O^{9}$. By boiling glycyrrhizin with dilute hydrochloric acid, it is resolved into a resinous amorphous bitter substance named glycyrretin, and an uncrystallizable sugar having the characters of glucose. The formula of glycyrretin has not yet been settled. Alkalies easily dissolve glycyrrhizin with a brown colour and emission of a peculiar odour. In the root it perhaps exists combined with ammonia, inasmuch as the aqueous extract evolves that alkali when warmed with potash. The sugar of liquorice root has not yet been isolated. Asparagin and malic acid have been obtained from it. The outer bark contains a small quantity of tannin.

Commerce.—The Bombay market is supplied from the Persian Gulf and Karachí. The kind known as Karachí liquorice is the best, and fetches from Rs. 50 to 80 per kandy of 5 cwts. Persian liquorice is smaller, and not so sweet.

Arachis hypogæa, *Linn., Bentl. and Trim., t.* 75. The seeds and oil.

Vernacular.—Wilayeti-mung, Chinai-bádám (*Hind.*), Bhui-singh (*Bomb.*), Verk-kadalai, Nilak-kadalai (*Tam.*)

History, Uses, &c.—The ground-nut, a native of Africa, is not mentioned in Hindu or Mahometan works on Materia Medica, nor does it appear to be used in India by the natives for any medicinal purpose. The seeds, however, are eaten like nuts, and are ground and pressed with other oily seeds to make the Gora Tel, or sweet oil of the bazar, which is largely used as an article of diet by the Hindus. In Bombay Kardi (Safflower seed), Tíl (Sesamum seed), and Bhui-singh (Ground-nuts), are usually pressed together to form this oil. As far as I can gather, the ground-nut does not appear to have been cultivated in India for more than about fifty years. It was probably introduced into Bengal from China, as it was first known in that part of the country as Chinai-bádám (Chinese almond). In Western India it was most likely introduced from Africa, or possibly by the Portuguese from Brazil, and was no doubt used only as an article of diet for a considerable time, just as the seeds of a closely allied plant (Voandzeia subterranea) imported from the Mozambique are at present in Goa and Bombay under the name of Mosambi-chana (Mozambique gram). The value of the ground-nut as an oil seed was first recognised in Europe about 1840, since which date its cultivation has been greatly extended. At the present time the seeds and oil are largely exported to Europe, where the latter is much used for soap-making. In Bombay the oil is expressed at the Government Medical Store Depôt for pharmaceutical purposes to the extent of about 6,000 lbs. annually. It is used as a substitute for olive oil. For making plasters the mixed sweet oil of the bazar may be used, but it requires rather more oxide of lead than ground-nut oil, the latter in the proportion of 90 lbs. of oil to 41 lbs. of oxide makes an excellent plaster of a very pale colour and perfect consistence. Ninety pounds of bazar oil will take 43 lbs. of oxide.

Description.—Cold drawn ground-nut oil is of a pale yellow colour, and has an agreeable nutty odour and bland taste. Sp. gr about 0·918, at —3° C. it becomes turbid, at —3° to 4° it concretes, and at —7° hardens; if long kept it becomes rancid.

Chemical composition.—The oil consists of the glycerides of four different fatty acids. The common oleic acid, $C^{18} H^{34} O^{2}$, that is to say, its glycerine compound, is the chief constituent, Hypogæic acid, $C^{16} H^{30} O^{2}$, has been pointed out by Gossman and Scheven (1854) as a new acid, whereas it is thought by other chemists to agree with one of the fatty acids obtained from whale oil. The melting point of this acid from Arachis oil is 34 to 35° C. The third acid afforded by the oil is ordinary palmitic acid, $C^{16} H^{32} O^{2}$, with a fusing point of 62° C.

Arachic acid, $C^{20} H^{40} O^{2}$, the fourth constituent, has also been met with among the fatty acids of butter and olive oil, and according to Oudemans (1866), in the tallow of Nephelium lappaceum, *Linn.*, an Indian plant of the order Sapindaceæ. When ground-nut oil is treated with hyponitric acid, which may be most conveniently evolved by heating nitric acid with a little starch, a solid mass is obtained, which yields by crystallization from alcohol elaidic and gœidinic acids, the former isomeric with oleic, the latter with hypogœic acid. (Pharmacographia, p. 163.)

Commerce.—The plant is cultivated in many parts of Western and Southern India. The fluctuations in the quantity exported and in the price of the seeds indicate that the crop is an uncertain one liable to partial failure from the attacks of insects or from an insufficient rainy season. In the Bombay market the price of the seeds ranges from Rs. 25 to Rs. 30 per kandy (5 cwts.) according as the supply is abundant or otherwise. There are two varieties, a light-coloured seed which is perferred for eating but does not yield much oil, and a reddish seed which yields much oil. The best oil seed is grown in the Nasik district. During the last two years there has been a rapid increase in the quantity of ground-nuts exported from Bombay to Europe; in 1879-80, the exports were valued at 2 lakhs of Rupees, in 1880-81 eight and one quarter lakhs, in 1881-82 sixteen lakhs, of which latter quantity France alone took 12⅘ lakhs, of the remainder Belgium took 2 lakhs worth, Germany Rs. 2,760, Holland Rs. 17,633, Italy Rs. 6,000, and England Rs. 1,381. In 1884-85 the whole of India exported 676 thousand cwts.

Cæsalpinia Bonducella, *Fleming*, *Roxb.*, *Gärt. Fruct. ii., t.* 148; *Bentl. and Trim., t.* 85. The seed.

Vernacular.—Katkaranj, Karanjú, Katkaleja (*Hind.*), Ságurghota, Ságurghola, Gajga, (*Bomb.*), Gech-chakkay (*Tam.*), Nata (*Beng.*)

History, Uses, &c.—This plant, called in Sanskrit Putikaranja, in Arabic Akitmakit, and bearing in Persia the vulgar name of Kháya-i-Iblis (Devil's testicles), has long been well known both to the Hindus and Mahometans as having medicinal properties; it appears to be found near the coast in all hot countries, its extensive distribution being caused by the transportation of its seeds from one country to another by means of oceanic currents. Ibn Sína says that its medicinal properties resemble those of the Peony. In Persia and India the seeds are considered to be hot and dry, useful for dispersing swellings, restraining hæmorrhage, and keeping off infectious diseases. Half a seed rubbed up with several cloves is said to relieve the pain of colic, and with long pepper to be a valuable remedy for malarious fevers. The seeds roasted and powdered are administered for hydrocele internally, and at the same time applied externally, spread upon castor-oil leaves. They are also given internally in leprosy, and are thought to be anthelmintic. The oil in which they have been boiled for a long time is applied to wounds to promote cicatrization. The oil expressed from the seed is used as a cosmetic; it is said to soften the skin and remove pimples, &c. Necklaces of the seeds strung upon red silk are worn by pregnant women as a charm to prevent abortion, and are hung upon trees to prevent their fruit falling off. Ainslie notices the use of the seeds in conjunction with spice as a tonic by native practitioners, also their use as an external application to Hydrocele. He besides draws attention to the root and leaves as having similar properties. In the Concan the juice of the leaves with yellow zedoary and Butea frondosa seeds is given to children for intestinal worms. Four tolás of the juice is given as an antiperiodic in fever, and the seeds with gúr in hysteria. Recently (1868) the seeds have been made official in the Phar. of India as a tonic and antiperiodic, and in the compound powder (also official) the native form of administration with black pepper has been adopted. From the notes at the end of the Pharmacopœia it will be seen that the general tenor of the reports from medical officers in India is in favour of the antiperiodic and tonic effects of the remedy. In Bombay the seeds are always kept in the druggists' shops, and are much used by native practitioners in the various ways above described. The specific name of the plant is derived from the Arabic word Bunduk, which means a little ball of earth and also a filbert. In all Arabic books on Matera Medica which I have seen it has the latter meaning. The word is an Arabic form of the Persian Finduk, the real Arabic for a filbert being Jilawz. Bonduc nuts in Arabic and Persian works will be found described under the name Akitmakit. The Bunduk-i-Hindi of the same works is the soap-nut (Sapindus trifoliatus, *Linn.*)

Description.—The seeds are nearly globular, ½ to ¾ of an inch in diameter. They are of a dull grey colour, smooth, very hard; the umbilicus is surrounded by a small, dark brown, semilunar blotch opposite the micropyle; the shell is very thick, and contains a white kernel, which consists of two cotyledons and a thick radicle having a very bitter taste. The bark and wood of the root are hardly at all bitter. A microscopic examination shows the presence in the cotyledons of mucilage, starch, oil, and albumen. The cells of the testa are blackened by perchloride of iron, showing the presence of tannin.

Chemical composition.—The following examination of the chemical nature of the bitter principle in the seeds has been made by the authors of the Pharmacographia; they say:—"One ounce of the kernel was powdered and exhausted with slightly acidulated alcohol. The solution after the evaporation of the alcohol was made alkaline with caustic potash, which did not produce a precipitate. Ether now shaken with the liquid completely removed the bitter matter, and yielded it in the form of an amorphous white powder, devoid of alkaline properties. It is sparingly soluble in water, but readily in alcohol, forming intensely bitter solutions; an aqueous solution is not precipitated by tannic acid. It produces a yellowish or brownish solution with strong sulphuric acid, which acquires subsequently a violet hue. Nitric acid is without manifest influence. From these experiments, we may infer that the active principle of the Bonduc seed is a bitter substance not possessing basic properties."

Commerce.—The seeds are collected in the neighbourhood, and sold to the druggists. Value, Rs. 12 per cwt.

Cæsalpinia digyna, *Rottl.*

Vernacular.—Vákeri-mul. The root is used in native practice, and has marked astringent properties. It is given internally in 6 massa doses and mixed with milk, ghi, cummin and sugar, in phthisis and scrofulous affections; when sores exist it is applied externally as well, a kind of tuberous swelling which is found on the root is preferred.

Cæsalpinia sappan, *Linn., Roxb. Cor. Pl. i.* 17, *t.* 16. The wood.

Vernacular.—Patang (*Hind.* and *Bomb.*), Vattangi, Vattekku, Vartangi (*Tam.*), Bakam (*Beng.*)

History, Uses, &c.—Sapanwood, in Sanskrit Pattanga and in Arabic and Persian Bakam, is by some Sanskrit authors included among the different kinds of Sandalwood in the same manner as the wood of Pterocarpus santalinus is. (*Vide* P. santalinus.) It is not generally used as a medicine either by Hindus or Mahometans, although it is described in their books as being of use to heal wounds and stop hæmorrhage from the lungs. Ainslie, however, says that the Vytians consider a decoction of the wood as a powerful emmenagogue, and remarks that the Cochin-Chinese hold the same opinion. In the Bengal Dispensatory, and more recently in the Pharmacopœia of India, it is recommended as a substitute for Logwood. At the Bombay Government Medical Depôt it has been used instead of Logwood for some years. Patang is used as a dye, and a very large quantity is consumed in the preparation of Gulál, the red powder which the Hindus cover themselves with at the time of the Holi festival. This powder is made by exhausting the wood with water, the liquid extract is then poured upon Towkir (arrowroot of Curcuma angustifolia) and well mixed by treading it with the feet, alum is then added, and the mixture dried and powdered. Some makers also add a little carbonate of soda.

Description.—The wood is solid, heavy, hard and close-grained, whitish when freshly cut, but becoming red from exposure to the air. It has no particular taste or smell, but is astringent and communicates a fine red colour to water and alcohol. Alkalies increase the yield of colouring matter and turn it to a reddish violet.

Chemical composition.—The colouring matter of Sapanwood appears from Bolley's investigations to be identical with Chevreul's brazilin obtained from brazilwood. Sapan red or brazilin, $C^{22} H^{20} O^{7}$, crystallizes from absolute alcohol in amber yellow or brownish rhombohedrons, or in short monoclinic prisms containing 66·66 per cent. carbon and 5·04 hydrogen (calc. 66·66 C, 5·04 H and 28·28 O); from hydrated alcohol or from aldehyde, in small straw-yellow or golden yellow monoclinic needles, containing $2 C^{22} H^{20} O^{7}\ 3 H^{2} O$, turning brown at 90°, and giving off 6·61 per cent. water; no more at 120° ($\frac{3}{2}$ at. $H^{2} O = 6·39$ per cent.) They gave by analysis 62·78 per cent. C and 5·48 H (calc. 62·41 C, 5·43 H and 32·16 O.) Brazilin is soluble in water, alcohol, and ether. The reddish aqueous solution is coloured deep carmine red by traces of ammonia, the fixed alkalies or baryta water. The alcoholic solution slowly evaporated in contact with air containing ammonia yields iridescent spangles, which give off ammonia when treated with potash, brazilin differs from hæmatoxylin by containing the elements of phenol in addition.

$$\underset{\text{Brazilin.}}{C^{22} H^{20} O^{7}} = \underset{\text{Hæmatoxylin.}}{C^{16} H^{14} O^{6}} + \underset{\text{Phenol.}}{C^{6} H^{6} O.}$$

Accordingly, brazilin treated with nitric acid yields picric acid, whereas hæmatoxylin thus treated yields nothing but oxalic acid. (Watt's Chem. Dict., Vol. V., p. 191.)

Commerce.—Two qualities are found in the market, *viz.*, Singapore or Dhansari. Value, Rs. 42 per kandy (7 cwts.), and Ceylon, value, Rs. 30 per kandy.

The imports into Bombay in 1881-82 amounted to 1,887 cwts., valued at Rs. 11,816.

Sesbania grandiflora, *Pers., Rheede Hort. Mal. i., t.* 51. The bark and flowers.

Syn.—Agati grandiflora.

Vernacular.—Agásta (*Bomb.*), Agáti (*Tam.*), Buko (*Beng.*)

Description, Uses, &c.—A native of the Eastern Islands, but cultivated in gardens all over India, and now quite naturalised; it is a tree of very short duration, attaining a height of about 30 feet in a few years and then dying. The leaves are abruptly pinnated, leaflets 21 pairs or fewer, oblong-ovate, 1 to 1½ inch long; taste a little acid and astringent. The calyx is campanulate, two-lipped, flowers papilionaceous, white or red, very large and fleshy in 2 to 4 flowered axilary racemes, taste mucilaginous and bitterish, legumes pendulous, very long, slightly flattened, contracted between the seeds. The bark is much fissured longitudinally, of a greyish-brown externally, the dry suber nearly equal to the living portion in thickness; in the fissures may be seen numerous small tears of gum of a garnet-red when fresh, but soon becoming almost black by exposure to the air. The outer portion of the living bark is of a red colour, and is loaded with the same kind of gum in a soft state. The gum is partially soluble in spirit and also in water, leaving a gelatinous residue of small bulk; it is very astringent and would appear to be a kind of kino. The bark is also very astringent but not bitter as stated in the Phar. of India, where it is recommended as a tonic by Dr. Bonavia. The statement that it is a bitter tonic occurs also in the Bengal Dispensatory. In Bombay the leaves or flowers are made use of by the natives, their juice being a popular remedy in nasal catarrh and headache; it is blown up the nostrils and causes a very copious discharge of fluid, relieving the pain and sense of weight in the frontal sinuses.* The root of the red flowered variety, rubbed into a paste with water, is applied in rheumatism; from 1 to 2 tolás of the root-juice are given with honey as an expectorant in catarrh; a paste made of the root with an equal quantity of Stramonium root is applied to painful swellings. The flowers are cooked and eaten as a vegetable. In some works the leaves are said to be aperient. I have not seen them used for this purpose.

Microscopic structure.—In the vascular zones of the bark are large laticiferous vessels which are filled with fluid gum of a pale red colour. The dry suber is loaded with small deposits of gum.

Sesbania ægyptiaca. *Pers., Wight Ic., t.* 32; *Rheede Hort. Mal. vi., t.* 27.

Vernacular.—Jet, Rásin (*Hind*), Jayanti (*Beng.*), Champai, (*Tam.*), Shevári (*Bomb.*)

History, Uses, &c.—This small, quick growing tree, is extensively cultivated in India, where the stems are used as a substitute for bamboos. It is the Sesbán of the Arabs and Egyptians, who use the seed medicinally to check diarrhœa and excessive menstrual flux. Prosper Alpinus says of the seed:—"Et ut uno verbo dicam, in omnibus vacuationibus firmandis illorum seminum usum habent frequentissimum." Mír Mohammad Husain gives a similar account of them, and adds that they reduce enlargement of the spleen, and that the plant is obnoxious to fleas. He gives Gul-i-anwel as the Hindi name. In the Calcutta Exhibition Catalogue it is stated that the seeds are applied in ointment to eruptions, for which the juice of the bark is given internally, but the nature of the eruptions is not specified. Wight remarks that the leaves are much used in poultices to promote suppuration. The Marathas have a superstition that the sight of the seeds will remove the pain of scorpion stings.

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* This kind of medicament is the *ῥινεγχυτον* of Galen. In Scrib. Larg. Comp. 7, we read:—"Per nares ergo purgatur caput iis rebus infusis per cornu quod rhynenchytes vocatur; Hederæ succo per se, vel betæ succo, cum exiguo flore æris, vel cyclamini succo mixto lacte aut aqua pari mensura."

Cæsalpinia pulcherrima, *Swartz, Bot. Mag., t.* 995; *Rheede Hort. Mal. vi., t.* 1. The bark, leaves, flowers, &c.

Syn.—Poinciana pulcherrima.

Vernacular.—Gul-i-turah, Krishna-chûra (*Hind.* and *Beng.*), Sandesra, Sandesha (*Bomb.*), Mail-kannai, Komri (*Tam.*).

History, Uses, &c.—This elegant shrub, named after M. de Poinci, once Governor of the Antilles, has become quite naturalized in India, and is one of the commonest garden shrubs in Bombay. According to Ainslie it was introduced into the Botanical Gardens in Calcutta in 1792. He gives the following description of it:—"The species in question is a most beautiful tree which commonly rises to about 12 to 14 feet high, with leaves doubly pinnate, and leaflets oblong-oval, emarginate; they and the calices smooth; corymbs simple, petals fringed; stamens very long. It would appear to be a native of both the Indies; it is the Hoa-phung of the Cochin-Chinese; on the Malabar Coast it is called Tsietti-mandáru; in Ceylon, its common name is Monora-mal; and from its extreme beauty, Burmann gave it the appellation of 'Crista pavonis flore elegantissimo variegato.' The French in the West Indies call it 'Fleur de paradis.' The flowers come out in loose spikes at the extremity of the branches, the petals which have an agreeable odour are beautifully variegated with a deep red or orange colour, yellow, and some spots of green." All parts of the plant are said to be emmenagogue and purgative, but there appears to be no record of any exact observations upon this point. In the Concan 3 tolás of the juice of the leaves is administered once a day as a cure for rheumatism.

Description.—The bark is ash-coloured, smooth, thickly studded with small elliptic corky warts, the whole of the suber readily separates like birch bark, disclosing a streaky, mottled, green and pink surface, which is marked by numerous small scars corresponding to the warts above mentioned; the substance and internal surface of the bark is of a pinkish tinge. Taste rather nauseous, very astringent, microscopic structure not in any way peculiar, parenchyme loaded with starch, many cells contain red colouring matter.

Cicer arietinum, *Linn.*, *Wight Ic.*, *t.* 20; *Bot. Mag.*, *t.* 2274. The seeds and vinegar or acid exudation.

Vernacular.—Chana (*Hind.*), Chana, Harbara (*Bomb.*), Kadalai (*Tam.*); the vinegar, Chane-ka-sirkah (*Hind.*), Chana-amba (*Bomb.*), Kadalai-kádi (*Tam.*)

History, Uses, &c.—This pulse is the Cicer of the Romans.* Plautus† and Horace‡ speak of 'Cicer frictum,' 'parched-gram,' which would appear to have been eaten by the poorer classes just as it is in India now. The Italians call it 'Cece.' The plant is cultivated in the south of Europe and also in India, the leaves and stems are covered with glandular hairs containing oxalic acid, which exudes from them in hot weather and hangs in drops, ultimately forming crystals. In India the seeds form one of the favourite pulses of the natives, being eaten raw or cooked in a variety of ways; the flour is also much used as a cosmetic and in cookery. Cicer is the ερεβινθος of Dioscorides. The acid liquid, which is obtained by collecting the dew from the plant, is mentioned in Sanskrit works under the name of Chanakámla, and is described as a kind of vinegar having acid and astringent properties, which is useful in dyspepsia, indigestion, and costiveness. Moidín Sheriff gives the following description of its collection:—"In a great many parts of India, where C. arietinum is cultivated, a piece of thin and clean cloth is tied to the end of a stick, and the plants are brushed with it early in the morning, so as to absorb the dew, which is then wrung out into a vessel." The fluid thus collected consists of water holding in solution oxalic, acetic and perhaps malic acid, and according to Dispan, another acid peculiar to the plant. (Watt's Chem. Dict., Vol. I., p. 962.) Dr. Hove (1787) says :— " On the road (to Dholka) we met with numerous women who gathered the dew of the grain, called by the inhabitants *chana*, by spreading white calico cloths over the plant, which was about 2 feet high, and then drained it out into small hand jars. They told me that in a short period it becomes an acid, which they use instead of vinegar, and that it makes a pleasant beverage in the hot season when mixed with water." Dr. Hove states that the freshly collected fluid tasted like soft water, but that some which he preserved became after some days strongly acid.

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* Col. 2, 10. Plin, 18, 12. † Plaut. Bac., 4, 5, 7. ‡ Hor. A. P. 249.

According to Dr. Walker (Bomb. Med. Phys. Trans., 1840, p. 67), the fresh plant put into hot water is used by the Portuguese in the Deccan in the treatment of dysmenorrhœa; the patient sits over the steam. He remarks this is only another way of steaming with vinegar. Notices of the acid liquid, its uses by the natives, and mode of collection, are given by Dr. Christie (Madras Lit. Sci. Journ., Vol. IV., p. 476); Dr. Heyne (Tracts, p. 28); Ainslie (Mat. Ind., Vol. II., p. 56); and Drury (Useful Plants of India, p. 135).

Commerce—The vinegar is sold in the bazar, but dilute sulphuric acid is often substituted for the genuine article.

Saraca indica, *Linn., Bedd. Fl. Sylv., t.* 57; *Burm. Fl. Ind.*, 85, *t.* 25, *f.* 2; *Wight Ic., t.* 206; *Bot. Mag.*, 3018. The bark.

Vernacular.—Asok (*Hind.* and *Beng.*), Asoka, Jásúndi (*Bomb.*)

History, Uses, &c.—This tree, which is covered with cymes of rich orange-coloured flowers in February and March, is famed in Hindu mythology from the circumstance of Sita, the wife of Rámchandra, having been confined by Rávana in a grove of Asoka trees. The bark is much used by Hindu physicians in uterine affections, and especially in menorrhagia. Chakradatta directs a decoction of the bark in milk to be made by boiling eight tolás of it with eight tolás of milk and thirty-two tolás of water till the latter has evaporated. This quantity is given in two or three divided doses during the course of the day in menorrhagia. (Dutt's Hindu Mat. Med., p. 143.) In the neighbourhood of Bombay the tree is often to be seen planted. It is said by Mr. Law (Graham's Cat., p. 62), to grow wild at the foot of the Ram Ghaut. The Bombay gardeners call the Guatteria longifolia (Anonaceæ) "Asoka," and have an idea that it is the male of Saraca indica.

Cassia fistula, *Linn.*, *Wight Ic.*, *t.* 269; *Bentl. and Trim.*, *t.* 87. The fruit.

Vernacular.—Amaltás (*Hind.*), Bhava, Gurmala (*Bomb.*), Konraik-kai, Sharak-konraik-kai (*Tam.*), Sondhali (*Beng.*)

History, Uses, &c.—The pulp contained in the legumes has long been used medicinally by the Hindus. The Sanskrit names for the tree are Aragbadha, Suvarnaka, and Rajataru, or king of trees, on account of the beauty of the long racemes of yellow flowers, which resemble those of the Laburnum, but are much larger. In Hindu medicine the pulp is used as a cathartic, and the root is also sometimes given as a laxative. A compound decoction (Aragbadhadi) is directed to be used by Chakradatta; it contains Cassia pulp, Picrorrhiza Kurroa, Chebulic myrobalans, long pepper root and Cyperus rotundus (Dutt's Hindu Mat. Med., p. 155.) In Mahometan works the drug is called Khiyar-shambar, an Arabic corruption of the Persian Khiyar-chambar, and the pulp Asal-i-Khiyar-chambar (honey of Khiyar-chambar). Chambar means a necklace in Persian, and is probably an allusion to the structure of the pod. Persian dictionaries give Katha-el-Hind (Indian cucumber) as the Arabic name. Through the Arabians the drug became known to the later Greek physicians. Nicolaus Myrepsicus calls it γλυκοκάλαμον. Joannes Actuarius who practised at Constantinople towards the close of the 13th century, describes it minutely.* In the Makhzan-el-Adwiya the pods are directed to be slightly warmed, and the pulp extracted and rubbed up with a little almond oil for use. It is described as lenitive, useful for relieving thoracic obstructions, and heat of blood, a safe aperient for children, and women even when pregnant, but slow in its action. With tamarinds it is said to be a good purge for adust bile; with turbith or polypodium for cold humours and melancholy; with linseed or almond oil and combined with other suitable remedies such as Dulcamara it is recommended for the removal of obstructions of the abdominal viscera. Externally it is said to be a good application in gout, rheumatism, &c. The flowers and leaves are said to have lenitive properties, and a conserve of the former is mentioned. From 5 to 7 of the powdered seeds are prescribed as an emetic, and the shell of the pod rubbed down with saffron, sugar, and rose water, in difficult parturition. In the Pharmacographia (p. 195), it is shown that the Cassia fistula of the Greeks and Romans was a kind of cinnamon. Ainslie notices the use of the pulp and flowers by the natives of India, and says that it is mentioned by Avicenna under the name of Khiyarchambar, also by Serapion, and Prosper Alpinus in his work, "De plantis Ægypti." Dr. Irvine (Top. of Ajmeer) states that he found the root act as a strong purgative. In the Concan the juice of the young leaves is used to cure ringworm, and to allay the irritation caused by the application of the marking-nut juice.

Description.—The ovary of the flower is one-celled with numerous ovules, which, as they advance towards maturity, become separated by the growth of intervening septa. The ripe legume is cylindrical, dark chocolate brown, 1½ to 2 feet long, by ¾ to 1 inch in diameter, with a short strong woody stalk, and a blunt end suddenly contracted into a point. The fibro-vascular column of the stalk is divided into two broad parallel seams, the dorsal and ventral sutures running down the whole length of the pod. The sutures are smooth, or slightly striated longitudinally; one of them is formed of two ligneous bundles coalescing by a narrow line; each of the 25 to 100 seeds which a legume contains, is lodged in a cell formed by very thin woody dissepiments. The oval flattish seed, from 3-10th to 4-10th of an inch long, of a reddish-brown colour, contains a large embryo whose yellowish veined cotyledons cross diagonally, as seen on transverse section, the horny white albumen. One side is marked by a dark line (the raphe). A very slender funicle attaches the seed to the ventral suture. In addition to the seeds the cells contain a soft black pulp which has a mawkish sweet taste. (Pharmacographia, page 196.)

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* Meth. Med. v., 2.

Chemical composition.—According to Braconnot, 20 parts of the pulp consist of sugar 12·00, gum 1·35, astringent matter, gluten, colouring matter and water make up the remaining portion, the water amounting to about 3·80; no cathartic principle has been discovered. An analysis of the roots said to be strongly purgative is a desideratum.

Commerce.—The pods are worth in Bombay Rs. 14 per kandy of 5 cwts.

Cassia sophera, *Linn., Jacq. Ic., t.* 73; *Rheede Hort. Mal. ii., t.* 52. The leaves, seeds and roots.

Vernacular.—Sari-kasondi Káli-kasondi, (*Hind.*), Jangli-tákla, Rán-takla (*Bomb.*), Ponna-virai, Pérá-virai (*Tam.*), Kal-kasonda (*Beng.*)

History, Uses, &c.—The Sanskrit name of this plant is Kásámardá, and signifies "destroyer of cough"; it is supposed by the Hindus to have expectorant properties. It is also noticed in Mahometan works as a remedy for snake-bites, the root is directed to be given with black pepper. A plaster or poultice of the root with sandalwood is said to cure ringworm.

Description.—Annual; erect, branched, glabrous; leaflets 6 to 12 pair, lanceolate, or oblong-lanceolate, acute with a single gland near the base of the petiole; racemes terminal or axillary, few flowered; upper petal retuse; legumes long, linear, turgid, glabrous, many-seeded; suture keeled; seeds horizontal with cellular partitions; flowers middle-sized, yellow. The plant has a heavy disagreable smell, and a purplish tinge, the root is fibrous and woody. It springs up on waste ground during the rains, and flowers in November.

Chemical composition.—This plant, like several others of the same genus, owes its medicinal activity to the presence of chrysophanic acid, sometimes called Rhein, Form. $C^{14} H^{6} O^{2''} (O H)^{2}$. This substance belongs to the anthracene group of carbon compounds, and like alizarin is regarded as dioxyanthraquinone, $C^{14} H^{6} O^{2''} \left\{ \begin{matrix} O & H \\ O & H \end{matrix} \right\}$. It crystallizes in six-sided prisms, is tasteless, and may be sublimed without decomposition; it is contained in Goa Powder (50 °/ₒ), rhubarb, most varieties of dock, Lichen orcella, Parmelia parietina, Cassia alata, C. occidentalis, C. tora, &c. As met with in commerce it is in the form of a light yellow powder, soluble in benzol, chloroform, turpentine, and in the fixed and volatile oils to a large extent, sparingly soluble in ether and alcohol, and insoluble in water, glycerine and in solid paraffin. It is dissolved by sulphuric and nitric acids (in the latter to a less extent) by caustic potash and by ammonia; fuses at 123°·2 C., and boils at 232°·2 C. At the latter temperature it is decomposed into a dark green resinous substance, which is largely soluble in ether. Ol. Jecoris dissolves twice its weight of the acids, yielding a mixture containing 70 °/ₒ. Ol. olivæ, Ol. Pini sylvest. Creasotum, Ol. Terebinth., Ol. Lavand., and Vaseline, dissolve readily their own weight of acid, yielding mixtures containing 52 °/ₒ. Taking advantage of its solubility in the fixed oils, a considerable saving may be affected by preparing ointments direct from Araroba. Ol. olivæ thoroughly exhausts that substance, yielding the acid after removal of the oil by ether in a state of purity. The Cinghalese doctors take advantage of this fact and fry the leaves of Cassia alata, C. tora, C. occidentalis, and C. sophera in gingelly or castor oil. The strained product is used as an ointment for ringworm and other skin diseases. (J. Laker Macmillan, Phar. Journ., 15th March 1879.)

Cassia occidentalis, *Linn., Bot. Reg., t.* 83. The leaves, seeds and root.

Vernacular.—Kasondi, Bari-kasondi (*Hind.*), Hikal, Rántákla (*Bomb.*), Nattam-takarai (*Tam.*)

History, Uses, &c.—This plant is regarded as a variety of the last mentioned by the natives of India; it has the same Sanskrit name, and is considered to have much the same medicinal properties. Mahometan writers also treat the two plants as varieties of the same species; they describe Kasondi as alexipharmic, useful in the expulsion of corrupt humours and to relieve cough, especially whooping cough. In the French-African colonies the seeds are called "negro coffee"; they are employed in France and in the West Indies as a febrifuge, chiefly in the form of vinous tincture (℥ii to Oij of Malaga wine), an infusion of the root is considered by the American Indians to be an antidote against various poisons. Torrefaction is said to destroy the purgative principle in the seeds, and make them taste like coffee. The whole plant is purgative. Dose of leaves about 90 grains. In the Concan 2 to 6 gunjas of the seeds are pounded and heated with a tolá of women's or cows' milk, strained and given once a day as a cure for the convulsions of children, or 6 massa doses may be given to the mother or wet-nurse.

Description.—Annual; erect, branches glabrous; leaflets 3 to 5 pairs, without glands between them, ovate-lanceolate, very acute, glabrous on both sides; petiole with a large sessile gland near its tumid base; flowers longish-pedicelled, yellow, upper ones forming a terminal raceme, lower ones 3 to 5 together on a very short axillary peduncle; legumes long, surrounded with a tumid border. The plant appears in the rains upon waste ground and rubbish; it has a sickly offensive smell.

Chemical composition.—Examined by Clonet (1876), the seeds were found to contain:—Fatty matters (olein and margarin) 4·9; tannic acid, 0·9; sugar, 2·1; gum, 28·8; starch, 2·0; cellulose, 34·0; water, 7·0; calcium sulphate and phosphate, chrysophanic acid, 0·9; malic acid, sodium chloride, magnesium sulphate, iron, silica, together, 5·4; and achrosine, 13·58 parts in 100. The latter substance was obtained by exhausting the powder of seeds previously treated with ether, by means of alcohol of 60 per cent. The alcohol is distilled off, the syrupy residue treated with absolute alcohol, which dissolves out various constituents, leaving a solid brown red mass, having when dry a resinous fracture, and being soluble in water, to which it communicates a garnet colour. It contains C H O N and S, but its exact composition has not been determined (it is most likely a mixture of various bodies). It is soluble also in weak alcohol, and in acids and alkalies. The colour cannot be fixed upon tissues by any known mordant. This circumstance induced Professor Clonet to term it achrosine, or "not colouring," although being coloured itself. The seeds are the most active part of the plant, and readily act as an emeto-cathartic. (Confer. Year-Book of Pharmacy, 1876, p. 179.)

Cassia obovata, *Collad., Wight Ic., t.* 757; *Bentl. & Trim., t.* 89. The leaves.

Syn.—Cassia senna.

Vernacular.—Bhúí Tarwar (*Bomb.*)

Description, Uses, &c.—This plant is the C. obtusa of Roxburgh. It is very common in many parts of the Bombay Presidency, but is not cultivated. The whole plant in seed is sometimes offered for sale in the bazar as country senna in contradistinction to the senna which is in general use, and which is imported from Arabia. C obovata is perennial, herbaceous, and diffuse; leaflets 4 to 6 pair, obovate obtuse, mucronate, glabrous; racemes axillary, few flowered, much shorter than the leaves; legumes lunate, broad, thin, obtuse; valves crested at the seeds. It occurs in Guzerat, Sind, the Deccan, and the Southern Maratha Country. The following notice of it occurs in the Pharmacographia :—"This species was the first known to botanists, and was cultivated in Italy for medicinal use during the first half of the 16th century. Hence the term Italian senna used by Gerarde and others. It is more widely distributed in the Nile region than the other species, and is also found in India, and (naturalized) in the West Indies. Its leaflets (also pods) may occasionally be picked out of Alexandrian senna. It is called by the Arabs *senna baladi* (wild senna), and grows in the fields of durra (Sorghum) at Karnak and Luxor, and in the time of Nectoux was held in such small esteem that it fetched but a quarter of the price of the *senna jebeli* brought by the caravans of Nubia and the Bisharrin Arabs. It is not now collected."

Being very abundant in India it might occasionally be found useful as a substitute for officinal senna.

Cassia auriculata, *Linn., Plu. Alm., t.* 314, *f.* 4. The bark and seeds.

Vernacular.—Tarwar (*Hind.*), Tarwar (*Bomb.*), Avirai (*Tam.*)

History, Uses, &c—Ainslie says:—"The small, flat, pleasant-tasted, heart-shaped seeds of this species of Cassia, the Vytians reckon amongst their refrigerants and attenuants, and prescribe them in electuary, in cases in which the habit is preternaturally heated, or depraved. They also consider the powder of the dry seeds as a valuable external remedy (blown into the eye), in certain stages of ophthalmia; of the electuary the dose is a small teaspoonful twice daily. Dr. Kirkpatrick (Cat. of Mysore Drugs) brings to notice the astringent properties of the bark, and speaks favourably of the use of the seeds as an application to the eyes in chronic purulent conjunctivitis. C. auriculata grows abundantly in the sterile tracts of the Deccan and Guzerat. It is of great importance to the tanner, and to workers in iron, who use the root in tempering iron with steel. (Gibson.) Another common use to which the wood is applied is the making of Datwans, or native tooth-brushes; for this purpose it is preferred to that of any other plant.

Description.—The bark as generally met with is about as thick as cinnamon, nearly smooth, externally reddish-brown, internally olive-green; it occurs in small strips or quills. Taste sweetish, and moderately astringent. Sections examined under the microscope show a deposit of crystals arranged like rows of beads in the course of the vessels, otherwise there is nothing remarkable. The seeds are smooth, flat, of an oval, oblong, or obscurely triangular form, obtusely pointed at one end. Their colour is brown, or dull olive-green; they are tasteless and inodorous.

Cassia tora, *Linn.*, *Dil. Elt.* 63, *f.* 73; *Rheede Hort. Mal.* *ii.*, *t.* 53. The leaves and seeds.

Vernacular..—Chakónda, Panwár (*Hind.*), Tákla, Kowaria (*Bomb.*), Ushit-tagarai, Tagarai (*Tam.*)

History, Uses, &c.—This plant is called by Sanskrit writers Chakramarda; it has a great reputation in all kinds of skin diseases. Chakradatta directs the seeds to be steeped in the juice of Euphorbia neriifolia, and afterwards to be made into a paste with cow's urine as an application to cheloid tumours. He also recommends the seeds together with those of Pongamia glabra as a cure for ringworm. Under the names of Sanjisaboyah, Sangisaboyah, and Chakond, Mahometan writers give an exact description of the plant, and notice the closing of the leaves at night. They consider the seeds and leaves to have solvent properties in those forms of skin disease accompanied by induration, such as leprosy, cheloid, psoriasis, &c., and mention their having been used with advantage in plague (waba), a term which is rather indefinite. Ainslie says:—"The mucilaginous and fetid smelling leaves of C. tora are gently aperient, and are prescribed in the form of decoction; and in doses of about 2 ounces, for such children as suffer from feverish attacks while teething; fried in castor oil they are considered as a good application to foul ulcers. The seeds ground with sour buttermilk are used to ease the irritation of itchy eruptions; and the root, rubbed on a stone with limejuice, is supposed to be one of the best remedies for ringworm (psoriasis). The leaves are also used as a poultice to hasten suppuration." The plant is to be found in every garden, and is used as a domestic remedy in Bombay just in the same manner as described by Ainslie. In the Concan the following prescription is used for itch:— Cassia tora seeds, 6 parts; Psoralia corylifolia seeds, 4 parts; carrot seeds, 2 parts; powder, soak in cow's urine eight days, and apply.

Description.—Leaflets 3 pairs, obovate, obtuse, glabrous, the terminal pair being much the largest, all folding up closely at night, flowers axilliary, generally in pairs, dull yellow; legumes about 6 inches long, narrow, quadrangular, about ⅛ of an inch in diameter, containing numerous elongated, very hard greyish seeds, the ends of which appear as if cut off obliquely. The whole plant has a fetid smell. The leaves when full grown are mucilaginous, and have a nauseous taste, but when young they are much used by the poor as a vegetable. The medicinal properties of C. tora are due to the presence of Chrysophanic acid.

Cassia alata, *Linn.*, *Wight Ic.*, *t.* 253; *Jacq. Obs. ii.*, 24, *t.* 45, *f.* 2. The leaves.

Vernacular.—Dádmardan (*Hind.*), Wiláyati-agti (*Bomb.*), Shimai-agatti, Vandukolli (*Tam.*)

History, Uses, &c.—The Sanskrit name is Dadrughna, and means curer of ringworm. The plant, however, is not a native, but has been introduced from the West Indies, where it has the same reputation as in the East. It is often cultivated in gardens, but does not flourish in Bombay; above the Ghauts it grows very well. The evidence which was collected by the authors of the Phar. of India is strongly in favour of its efficacy, and supports the favourable opinion of it expressed in the Bengal Pharmacopœia. The best way of applying it is to bruise the leaves and mix them with limejuice, the paste thus prepared is spread upon the affected part. The leaves have also purgative properties, and have been used in the same manner as Senna.

Description.—The leaves are two feet long or more, and consist of a triangular petiole, with from 8 to 14 pairs of leaflets. The first pair are the smallest, and are placed near the branch and separated from the second pair by a longer interval than there is between the other pairs. The terminal leaflets are as much as 5 to 6 inches in length. They are all obovate, oblong, obtuse, mucronate, and glabrous on both sides, and taste like Senna, but less nauseous.

C. Alata, like others of the genus, contains Chrysophanic acid, to which its medicinal properties are due.

Cassia absus, *Linn.*, *Burm. Zeyl.*, *t.* 97. The seeds.

Vernacular.—Cháksú, Chákút (*Hind.*), Káukuti, Chimr, Chinol (*Bomb.*), Karunkanam, Káttukkol (*Tam.*)

History, Uses, &c.—These seeds were used by the ancient Egyptians, through them the Greeks and Romans became acquainted with the drug. Dioscorides notices them as produced in Egypt, and calls them Akákális.* Mahometan writers following the Greeks describe the seeds as attenuant and astringent, and say that they strengthen the sight when used as a collyrium; they direct them to be prepared by enclosing them in a little dough and placing them inside an onion, which is then baked. The Arabic names for the seeds are Hab-es-soudán, and Tashmízaj, the latter being a corruption of the Persian Chashmizak. In Persia they are also called Cheshmak and Chashúm. According to Ibn Baitar, those which come from the Soudan are the largest and best. In some books a plaster made from the seeds is recommended as an application to wounds and sores, especially of the penis. In purulent conjunctivitis about a grain of the powdered seed prepared in the manner above mentioned is introduced beneath the eyelids. M. Cailliaud gives us the following description of the use of the seeds in Egypt:—" On concasse les grains et on les monde de leur tunique; elles se réduisent en une poudre jaunâtre que l'on met sèche en petite quantité à l'intérieur de la paupière inférieure, que l'on a eu soin d'abaisser. On verse la poudre entre le globe de l'œil et la paupière, en faisant tomber doucement cette poudre de dessus une petite pièce de monnaie où on l'a placée. Cette application cause une cuisson et une gêne, qui font tenir les paupières fermées, et qui font couler des larmes. La douleur se dissipe par degrés, en une demi-heure ou un peu plus; et les yeux, qui étaient fort injectés de sang avant et pendant l'opération, diminuent de rougeur, reprennent l'éclat de la santé, et font succéder une sensation de bien-être à l'appesantissement et à l'incommodité qui ont précédé. L'expérience nous a fait concevoir l'utilité de ce remède, dans le cas où l'inflammation, devenue chronique, est entretenue par un relâchement des parties. (Centurie de Plantes d'Afrique, p. 26.) The drug was tried by Dr. Harbauer at Brussels in 1822 with satisfactory results. (Confer. Graefe and Walthers Jour., 1825, Vol. VI., p. 1.) Dr. G. Smith, who tried it in the Eye Infirmary at Madras, thinks it a painful and dangerous application in ophthalmia and granular lids. He does not say, however, whether the seeds were baked before they were applied.

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* Dios. i., 103.

Description.—Cháksu seeds are black and polished, flat, of an irregular oval or oblong shape; the end where the hilum is situated is rather more pointed than the other, length and breadth nearly alike, about $\frac{1}{5}$ to $\frac{1}{6}$ of an inch; testa horny and thick; cotyledons yellow; taste bitter.

Commerce.—The seeds are imported from Sind and Cutch. Value, Rs. 4 per Surat maund of 37½ lbs.

Cassia angustifolia, *Vahl., Royle Ill., t.* 37; *Bentl. and Trim., t.* 91. The leaves.

Vernacular.—Sana-maki, Sona-maki (*Hind.* and *Bomb.*), Nilávirai (*Tam.*)

History, Uses, &c.—Senna was first used as a purgative medicine by the early Arabian physicians, who introduced it into Europe. The Sana-maki of native works on Materia Medica is Arabian Senna imported into India. The same species has latterly been cultivated in this country, especially about Tinnevelly, from which place large quantities of the leaf are exported to Europe. In the Bombay Presidency it is cultivated about Poona to supply the requirements of the Government hospitals, but not as an article of commerce. In the Bombay market Indian grown Senna is now always obtainable; much also passes through the port on its way to Europe, being brought up from Tinnevelly by the steamers which ply round the coast. Bombay is, moreover, the chief port for the importation of Arabian Senna, which is shipped from Mokha, Aden, and other Red Sea ports, and, re-exported, is me wtith in European markets as Bombay Sena.* Sana-maki is described in native works on Materia Medica as a purgative of phlegm and adust bile, clearing the brain, and acting as an attenuant of the system generally; it is considered especially useful in those diseases which are caused by an accumulation of corrupt humours, such as gout, rheumatism, &c. It is also thought to clear the skin of pimples, to expel worms from the intestines, and to remove any tendency to piles. Senna is prescribed in decoction and as a confection. A plaster made by mixing the powdered leaves with vinegar is recommended in skin affections, and combined with Henna is used to dye the hair black. In the Concan the seeds with those of Cassia fistula are pounded with curds and applied to cure ringworm; the seed of Cassia obovata are used in a similar manner. Senna appears to have been introduced into Europe by the Arabians about the ninth century. In France, in 1542, a pound of Senna was valued at 15 sols, the same price as pepper or ginger. The Arabian Senna, called Sana Hajazi or Jabali, is the produce of the uncultivated plant; it is collected by the Arabs in a careless manner, and is much mixed with pods, flowers, and portions of the stem; the natives consider the pods to be quite as efficacious as the leaves.

Description.—Leaves 5 to 8, jugate, oval-lanceolate, tapering from the middle towards the apex, from 1 to 2 inches long, glabrous or scantily pubescent, pale or subglaucous, subsessile. Legume from 7 to 8 lines broad; with the base of the style distinctly prominent on its upper edge; seeds obovate-cuneate, compressed; cotyledons plain, extending the large diameter of the seed in transverse section. (Oliver.)

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* The importation of Arabian senna is rapidly declining owing to the large quantity of Tinnevelly leaves now offered at extremely low rates.

Chemical composition.—The reader is referred to the Pharmacographia and other standard works on Materia Medica.

Commerce.—The imports of Arabian Senna into Bombay for many years amounted to about 5,000 cwts. annually; half this quantity was re-exported. Value, Rs. 5 to 6 per cwt. It was brought from Jedda, Aden, and Zanzibar, but now it is hardly obtainable.

Tamarindus indica, *Linn., Bedd. Fl. Sylv., t.* 184; *Bentl. and Trim., t.* 92. The pulp, leaves and seeds.

Vernacular.—Imlí, Amlí (*Hind.*), Amlí, Chintz (*Bomb.*), Puliyam-pazham (*Tam.*), Tentul (*Beng.*)

History, Uses, &c.—There would appear to be little doubt that the Tamarind tree is a native of some part of India, probably the South. It is found in a cultivated or semi-cultivated state almost everywhere, and the fruit, besides being an important article of diet, is valued by the Hindus as a refrigeant, digestive, carminative and laxative, useful in febrile states of the system, costiveness, &c. The ashes of the burnt suber are used as an alkaline medicine in acidity of the urine and gonorrhœa, the pulp and also the leaves are applied externally in the form of a poultice to inflammatory swellings. The Sanskrit names of the Tamarind are Tintidi and Amlika. The author of the Makhzan-el-Adwiya describes two kinds of Tamarind, *viz.*, the red, small-seeded Guzerat variety, and the common reddish brown. The first is by far the best. Mahometan physicians consider the pulp to be cardiacal, astringent and aperient, useful for checking bilious vomiting, and for purging the system of bile and adust humours; when used as an aperient it should be given with a very small quantity of fluid. A gargle of Tamarind water is recommended in sore throat. The seeds are said to be a good astringent, boiled they are used as a poultice to boils, pounded with water they are applied to the crown of the head in cough and relaxation of the uvula. The leaves crushed with water and expressed yield an acid fluid, which is said to be useful in bilious fever, and scalding of the urine; made into a poultice they are applied to reduce inflammatory swellings and to relieve pain. A poultice of the flowers is used in inflammatory affections of the conjunctiva; their juice is given internally for bleeding piles. The bark is considered to have astringent and tonic properties. (Makhzan-el-Adwiya.) The natives consider the acid exhalations of the Tamarind tree to be injurious to health, and it would appear that the cloth of tents allowed to remain long under the trees becomes rotten. Plants also are said not to grow under them, but this is not universally the case, as I have often seen fine crops of Andrographis paniculata and other shade loving plants growing under Tamarind trees. The word 'Tamarind' appears to be derived from the Arabic Tamar-Hindi (Indian date), and it was doubtless through the Arabians that a knowledge of the fruit passed during the Middle Ages into Europe, where, until correctly described by Garcia d'Orta, it was supposed to be produced by a kind of Indian palm.

Description.—The fruit is an oblong or linear-oblong, slightly compressed, curved, or nearly straight, pendulous legume, of the thickness of the finger, and 3 to 6 inches in length, supported by a woody stalk. It has a thin but hard and brittle outer shell or epicarp, which does not split into valves, or exhibit any very evident sutures. Within the epicarp is a firm, acid juicy pulp, on the surface of which and starting from the stalk are strong woody ramifying nerves; one of these extends along the dorsal (or concave) edge, two others on either side of the ventral (or convex) edge, while between these two there are usually 2 to 3, or 4 less regular and more slender nerves, all running towards the apex and throwing out branching filaments. The seeds, 4 to 12 in number, are each of them encolsed in a tough, membranous cell (endocarp), surrounded by the pulp (sarcocarp). They are flattened, and of irregular outline, being roundish ovate, or obtusely four-sided, about 6-10th of an inch long by 3-10 thick, with the edge broadly keeled or more often slightly furrowed. The testa is of a rich brown, marked on the flat sides of the seed by a large scar or areole, of rather duller polish than the surrounding portion, which is somewhat radially striated. The seed is exalbuminous, with thick hard cotyledons, a short straight included radicle, and a plumule in which the the pinnation of the leaves is easily perceptible. (Pharmacographia, p. 199.) The Indian commercial article forms a firm, black, sticky mass; with the pulp are mixed seeds, fibres and small fragments of the shell; it is usually salted. For pharmaceutical purposes it should be free from salt.

Microscopic structure.—Tamarind pulp consists of thin-walled cells; amongst them may be seen crystals, which are probably acid tartrate of potash.

Chemical composition.—According to Flückiger and Hanbury water extracts from unsweetened Tamarinds, sugar together with acetic, tartaric, and citric acids, the acids being combined for the most part with potash. The neutralized solution reduces alkaline cupric tartrate after a while without heat, and therefore probably contains grape sugar. On evaporation, cream of tartar and sugar crystallize out. In East Indian Tamarinds citric acid is present in but small quantity. No peculiar principle to which the laxative action of Tamarinds can be attributed is known. The fruit pulp diffused in water forms a thick tremulous somewhat glutinous and turbid liquid owing to the presence of pectin or vegetable jelly. The testa of the seeds abounds in tannin and after long boiling can be separated leaving the cotyledons soft. The latter have a bland mucilaginous taste, and are edible.

C. Mueller has examined nine samples of E. Indian Tamarinds with the following results :—

Seeds.	Pulp free from seeds.					Dry pulp.	
	Water.	Insol.	Pot. Tart.	Tart. acid.	Citric acid.	Pot. Bitart.	Tartaric acid.
Highest °/ₒ 38·0.........	30·81	20·2	6·01	8·80	3·95	8·25	12·25
Lowest °/ₒ 1·5.........	21·92	12·2	4·66	5·29	0·64	6·21	6·77
Average °/ₒ 13·9.........	27·00	16·2	5·27	6·63	2·20	7·20	9·09

He found very small quantities of malic acid, which were calculated as citric acid.—(Pharm. Centralhalle, 1882, Nos. 49 and 50. Year-Book of Pharmacy, 1883, p. 236.)

Commerce.—Large quantities of Tamarinds are shipped from Bombay to Persia and other northern countries. Some go to Europe, where they are used for pharmaceutical purposes. Tamarinds are sent to Bombay from Nasick, Poona, Juneer, Kaira, and Tullegaum. The red kind from Guzerat is most esteemed, and is worth Rs. 50 per kandy of 7 cwts. Some of the inferior kinds are not worth more than Rs. 20.

The pulp is prepared for the market by removing the seeds and epicarp by hand; the pulpy portion is then usually mixed with about 10 per cent. of salt and trodden into a mass with the naked feet; there are several qualities in the market, the chief difference being in the amount of care which has been taken in preparing them, the best is free from fibre and husk, the worst contains both as well as the seeds. Careful housekeepers prepare their own pulp, and expose it for a week to the sun and dew to ripen it.

Tamarind seeds are universally eaten by the natives; they are first roasted and soaked to remove the outer skin, then boiled or fried, when they become tolerably palatable. In the raw state they are used by the poor as an astringent masticatory like betelnut. A size made from the seeds is used as a dressing to country-made blankets.

Bauhinia variegata, *Linn., Rheede Hort. Mal i., t.* 32. The bark.

Vernacular.—Kachnár (*Hind.*), Kanchan (*Bomb.*), Kánchan (*Beng.*)

History, Uses, &c.—There are two varieties of this Bauhinia. The flowers of the one are purple, or deep rose-coloured, and of the other white, yellow and green; both are noticed in the Bhavaprakása under the names of Kovidara and Kanchanára, and are said to have similar properties, the bark being described as alterative, tonic, astringent and useful in scrofula, skin diseases, and ulcers. Chakradatta recommends the bark of the first variety in scrofulous enlargements of the cervical glands, and directs it to be given in emulsion with rice-water and ginger. Sárangadhara also recommends it for a similar purpose, and prescribes it in combination with guggulu (gum-resin of Boswellia serrata), myrobalans, and a number of aromatics. In the Concan the juice of the fresh bark with the juice of the flowers of Strobilanthes citrata, 10 tolás of each, is given as an expectorant, and the bark is used with ginger as an internal remedy for scrofula. Under the name Kachnár, the author of the Makhzan describes the bark as astringent, attenuant and tonic. He says it is used to check diarrhœa, to remove intestinal worms, and prevent the decomposition of the blood and humours; on this account it is useful in leprosy and scrofula. A gargle made from the bark with the addition of Akákiá (extract of Acacia pods) and Pomegranate flowers is mentioned as a remedy in salivation and sore throat, and a decoction of the buds in cough, bleeding piles, hæmaturia and menorrhagia.

Description.—The bark is grey, tolerably smooth, compact, fracture granular, reddish brown, the external surface is covered thickly with little elliptic warts of a darker colour than the rest of the bark, the internal surface is white and woody. The taste is feebly astringent; microscopic examination discovers nothing characteristic. In Bombay the juice of the fresh leaves of B. racemosa mixed with black pepper is applied to the head in fever attended with headache. This tree is known in the Concan by the names of Aupta and Wana-raja.

Bauhinia tomentosa, *Linn.*, *Bot. Mag.*, *t.* 5560; *Rheede Hort. Mal. i.*, *t.* 35. Ainslie tells us that the native practitioners in Southern India prescribe the small dried buds and young flowers of this plant in certain dysenteric affections. He says that they have little sensible taste or smell, though, the leaves, fresh and bruised or rubbed, have a strong but not unpleasant odour According to Rheede, a decoction of the root-bark is administered on the Malabar Coast in cases in which the liver is inflamed. The tree is not a native of this presidency, but may be seen in gardens in Bombay, and is easily recognised by its pale yellow flowers, marked with a large purple spot.

Mimosa pudica, *Linn.*, *Bot. Rep.*, *t.* 544.

Vernacular.—Lajálú (*Hind.*), Lájak (*Beng.*), Lájri (*Mar.*), Total-vadi (*Tam.*)

History, Uses, &c.—A native of Brazil long naturalized in India, and called in Sanskrit Khadira. Mír Muhammad Husain tells us that it is much valued as a medicine by the Indians, and is considered to be resolvent, alterative, and useful in diseases arising from corrupted blood and bile. The juice is also applied externally to fistulous sores. He says that at the time of the *Pakhad Nakshatra,* the Indian Mahometans resort to the places where the plant grows, wash, and offer some sweets and burn incense ; they then gather the plant, taking care that the shadow of the gatherer does not fall upon it, and dry it in the shade : when the moon is again in the same Nakshatra, they powder it and mix about four grains with cow's milk, and say the following *Mantar* seven times before they take it:—

بسم الله دولها امرت دولها سنکر ادان نمو نمو بشواد

The medicine is taken every day for three weeks in the same manner,—in the first week all bilious diseases and fevers are cured, in the second piles, jaundice, &c., and in the third leprosy, scabs and pox.

Ainslie, noticing its use in Southern India, says :—" A decoction of the root of this plant is considered on the Malabar Coast to be useful in gravellish complaints. The Vytians of the Coromandel side of India prescribe the leaves and root in cases of piles and fistula : the first are given in powder, in a little milk, to the quantity of two pagodas' weight or more during the day."

(Mat. Ind. II., 432.) In the Concan the leaves are rubbed into a paste and applied to hydrocele; and their juice with an equal quantity of horse's urine is made into an *anjan* used to remove films of the conjunctiva by setting up an artificial inflammation. In what is called *cracked pot cough* by the natives the root is directed to be gathered on Sunday, wrapped in Bhojpater, (Bark of Betula bhojpatra) and tied with a string made of silk of five different colours; this packet is to be kept in the sun and tied upon the patient's neck at ebb tide.

This is the commonest kind of sensitive plant, and is too well known to require description; it has an acid and pungent taste; the root is fibrous.

Entada scandens, *Benth., Scheff. in Nat. Tijdschr. Ned. Ind. xxxii.,* 99, *t.* 16—18; *Rheede Hort. Mal. viii., t.* 32—34; *ix., t.* 77. The seeds.

Syn.—Entada pusætha.

Vernacular.—Garambí, Gardul (*Bomb.*), Gila-gach (*Beng.*) Parin-kaka-vully (*Mal.*); the seeds, Pilpápra (*Bomb.*)

Description, Uses, &c.—The plant is a gigantic climbing shrub, remarkable for its legumes, which are several feet long, 4 to 5 inches broad, and spirally twisted; they are surrounded with a thick, very firm, polished entire rim, which is found to remain like a picture-frame when the less durable jointed body of the legume has disappeared. The joints are 10 to 30, one-seeded, ligneous, swelled in the centre, transversely furrowed, greenish ash-colour when ripe. (*Roxb.*) The seeds are more or less heart-shaped, flattened, about 2 inches in diameter, with a shining brown testa, which is 1-16th of an inch thick, and very tough and horny. In encloses two large, equal cotyledons which adhere to it, and thus form a central cavity. The radicle is patelliform, and lodged at the umbilicus of the seed. The substance of the cotyledons is white and insipid. When a thin section is cut and a drop of water placed upon it the water immediately becomes milky, and the opacity of the section is much diminished. Under the microscope this is seen to be due to the escape of oil globules and granular matter from their containing cells. The properties of the seeds do not appear to have been tested in European practice; among the natives they have the reputation of being emetic. Dalzell and Gibson (*Bomb. Flora,* Part I., p. 84), say :—" An infusion of the spongy fibres of the trunk is used with advantage for various affections of the skin in the Philippines, where it is called 'Gogo' (Adams); the seeds are eaten roasted in Soonda." From the latter part of this extract it would appear that the oil being expelled the seed becomes inert. Horsfield in his list of Javanese plants informs us that this plant is used as an emetic by the Javanese, but he does not say what part of the plant is used. Ainslie notices it under its Javanese name of Gandoo, and states that it is the Mahapus-woela of the Cingalese and the Faba marina of Rumphius. In the Calcutta Exhibition Catalogue it is stated that the seeds are used in pains of the loins and debility.

Acacia, several species. *Bentl. and Trim., t.* 94—95. Gum Arabic.

Vernacular.—Gum Arabic, Maswai-gond, Maklai-gond (*Bomb.*)

Extract of the pods, Akákia (*Bomb.* and *Arab.*)

History, Uses, &c.—There appears to be no mention of gum Arabic in Sanskrit works. It was known from a very early date in Egypt as Kami. Dioscorides calls it κόμμι in his chapter περὶ ακακίας Pliny mentions Gummi several times.* Arabic and Persian writers describe it under the name of Samgh-i-Arabi. The author of the Makhzan gives the following description of what it ought to be :—" The gum of the tree called Ammughilán or Mughilán (Acacia) of a yellowish white colour, shining, and perfectly soluble in water, forming a clear sticky solution." Gum is used medicinally by the Mahometans, who consider it to be pectoral, strengthening, and emollient, but do not attach the same importance to it as a medicine as we do. An account of the history of gum in Europe, and its production in Northern Africa will be found in the Pharmacographia. The gum Arabic of Bombay, known in European commerce as East India gum, is an imported article, and is brought from Aden and the Red Sea ports, no part of it being the produce of India. Two kinds are met with in this market, *viz.*, "Maklai," in large round tears or vermicular pieces, white, yellow, or reddish, much like gum Senegal, but more fissured (it derives its name from the port of Makalla), and "Maswai," in angular fragments and vermicular pieces, fissured, white, yellow or reddish, which derives its name from the port of Massowa. Both of these are good soluble gums, and if carefully sorted not much inferior to Kordofan gum. Both are exported to Europe, and form the East Indian gum of commerce. About 15,000 cwts. of these gums are annually imported into Bombay.

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* Plin. 3, 11; 12, 8; 13, 12.

Chemical characters and composition.—The following account is from the Pharmacographia :—"At ordinary temperatures gum dissolves very slowly and without affecting the thermometer in an equal weight of water, forming a thick, glutinous, slightly opalescent liquid, having a mawkish taste and decidedly acid reaction. At higher temperatures the dissolution of gum is but slightly accelerated, and water does not take up a much larger quantity even at 100° C. The finest gum dried at 100° C., forms with 2 parts of water a mucilage of sp. gr. 1·149 at 15° C.

"This solution mixes with glycerin, and the mixture may be evaporated to the consistence of a jelly without any separation taking place. Solid gum in lumps, on the contrary, is but little affected by concentrated glycerin. In other liquids, gum is insoluble or only slightly soluble, unless there is a considerable quantity of water present. Thus 100 parts of spirit of wine containing 22 volumes per cent. of alcohol, dissolve 57 parts of gum; spirit containing 40 per cent. of alcohol takes up 10 parts, and spirit of 50 per cent. only 4 parts. Aqueous alcohol of 60 per cent. no longer dissolves gum, but extracts from it a small quantity ($\frac{1}{5}$ to $\frac{1}{2}$ per cent. according to the variety) of resin, colouring matter, glucose, calcium chloride and other salts.

" Neutral acetate of lead does not precipitate gum Arabic mucilage; but the basic acetate forms even in a very dilute solution, a precipitate of definite constitution.

" Soluble silicates, borates, and ferric salts render gum solution turbid, or thicken it to a jelly. It is not a compound of gum with any of these substances which is formed, but in the case of the first, basic silicates separate. No alteration is produced by silver salts, mercuric chloride or iodine. Ammonium oxalate throws down the lime contained in a solution of gum. Gum dissolves in an ammoniacal solution of cupric oxide. Acted upon by nitric acid, mucic acid is produced.

" Small, air-dried lumps of gum lose by desiccation at 100° C. 12 to 16 per cent. of water. If gum independently of its amount of lime, be represented by the the formula $C^{12} H^{22} O^{11}$ 3 H^2 O, the loss of 3 molecules of water will correspond to a decrease in weight of 13·6 per cent.; in carefully selected colourless pieces, we have found it to amount to 13·14 per cent. At a temperature of about 150° C., gum parts with another molecule of water, and loses its solubility.

" When gum Arabic is dissolved in cold water and the solution is slightly acidulated with hydrochloric acid, alcohol produces in it a precipitate of Arabin or Arabic acid. It may be also prepared by placing a solution of gum (1 gum + 5 water), acidulated with hydrochloric acid, on a dialyser, when the calcium salt will diffuse out, leaving behind a solution of arabin.

" Solution of arabin differs from one of gum, in not being precipitated by alcohol. Having been dried it loses its solubility, merely swelling in water, but not dissolving even at a boiling heat. If an alkali is added, it forms a solution like ordinary gum. Neubauer, who observed these facts (1854-57), showed that gum Arabic is essentially an acid calcium salt of Arabic acid.

"Arabic acid dried at 100° C. has the composition $C^{12} H^{22} O^{11}$, and gives up $H^2 O$ when it unites with bases. It has, however, a great tendency to form salts, containing several equivalents of acid to one of base. An acid calcium arabate of the composition $C^{12} H^{20} Ca O^{11}$, 6 $C^{12} H^{22} O^{11}$, would contain 1·63 per cent. of calcium, corresponding to 3·4 per cent. of calcium carbonate. Such salts have been prepared by Neubauer, and also by Heckmeijer.

"The most carefully selected colourless pieces of gum Arabic yield from 2·7 to 4 per cent. of ash, consisting mainly of calcium carbonate, but containing also carbonates of potassium and magnesium. Phosphoric acid appears never to occur in gum.

"Natural gum may therefore be regarded as a salt of Arabic acid having a large excess of acid, or perhaps as a mixture of such salts of calcium, potassium and magnesium. It is to the presence of these bases, which are doubtless derived from the cell-wall from which the gum exuded, that gum owes its solubility.

"It still remains unexplained why certain gums, not unprovided with mineral constituents, merely swell up in water without dissolving, thus materially differing from gum Arabic. There is also a marked difference between gum Arabic and many other varieties of gum or mucilage which immediately form a plumbic compound if treated with neutral acetate of lead. The type of the swelling but not really soluble gums, is Bassora gum, but there are a great many other substances of the same class." (*Op. cit.*, p. 210.)

Gums yielded by Indian Acacias.

ACACIA ARABICA, *Willd.*, *Bedd. Fl. Sylv.*, *t.* 47; *Roxb. Cor. Pl.*, *t.* 149. *Vernacular*—Babul (*Bomb.* and *Hind.*), Kuru-veylam (*Tam.*) Bábhúl (*Mar.*) yields gum in great abundance in March and April. Much of it is of a bright red colour and translucent; sometimes it is almost colourless; very large masses are met with. As a gum it is of little value, as it forms a weak mucilage; the colour is also objectionable. It is entirely soluble in cold water and tastes like gum Arabic. Carefully selected samples might be used in medicine as a substitute for commercial gum. In the Concan a strengthening sweetmeat is made by frying the gum, with spices and butter, and making it into balls with sugar. In bloody seminal discharges 1 tolá of the young leaves with 4 massás of cummin and 2 tolás of sugar are eaten or given as a draught beaten up in milk.

Acacia Catechu, *Willd.*, *Roxb. Cor. Pl.*, *t.* 175; *Bentl. and Trim.*, *t.* 95. *Vern.*—Khair (*Hind.* and *Bomb.*), Vodalai (*Tam.*), yields a good soluble gum of a light yellow colour, in appearance not to be distinguished from inferior commercial gum. It forms a strong mucilage with cold water. I consider it to be a better substitute for gum Arabic than the gum of Acacia arabica. Watt says that a pure sample was in 1873 valued at 20*s.* to 25*s.* a cwt. in London.

Acacia Farnesiana, *Willd.*, *Bedd. Fl. Sylv.*, *t.* 52; *Wight Ic.*, *t.* 300. *Vernacular.*—Gu-kikar (*Hind.*), Gu-bábhúl (*Bomb.*), Veddavala (*Tam.*) The gum is collected in Sind and forms a part of what is known in Bombay as Karáchí gum.

Acacia leucophlæa, *Willd.*, *Bedd. Fl. Sylv.*, *t.* 48; *Roxb. Cor. Pl.*, *t.* 150. *Vernacular*—Sufed-kikar (*Hind.*), Pandhra Bábhúl, Hewar (*Bomb.*), Vel-velam (*Tam.*) The gum is of inferior solubility, it is sometimes found mixed with the Ghátí gum of the Bombay market. The bark is one of the principal famine foods of Rájpútána, where the tree is called Khejra.

Acacia Senegal, *Willd.*, *Guill. et. Per. Fl. Seneg. i.* 245, *t.* 56. *Vernacular.*—Khor (*Sind*). The gum forms part of the Karáchí gum of commerce, it is of excellent quality and well known in Europe as Gum Senegal. The European market is supplied from Africa, where the tree is called Verek and Hashab.

Akakia.—According to the best Arabic and Persian authorities, this is an extract prepared from the juice of the Karaz (fruit of the Acacia).* It should be heavy, hard and have an agreeable odour; small fragments held between the eye and the light should be of a bottle green colour; when seen in bulk it appears black. It is considered to be cold and dry, astringent, styptic, and tonic, and is used internally and externally in relaxed conditions of the mucous membranes, also as a collyrium in purulent conjunctivitis, and chronic congestion of the vessels of the conjunctiva. Applied as a lotion it is said to improve the complexion. With white of egg it is a good application to burns and scalds. Powdered it arrests hæmorrhage; in short, it is used in all cases in which an astringent is applicable. As sold in Bombay we find that its appearance agrees with the above description, but some samples have a reddish tinge like the glass of which hock bottles are made. The taste is sweet, astringent and mucilaginous. Placed in cold water it soon disintegrates, forming a mucilage in which floats a quantity of olive green or brownish green sediment, which appears to be chlorophyll; after filtration the mucilage is of the colour of mucilage of gum Arabic. Akakia is said to be imported from Turkey; it is kept by all Mahometan druggists; it occurs in bladders containing 5—6 ozs. each.

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* Acacia nilotica, *Delil. Fl. Ægypt.*, *t.* 963. *A. vera. Vesling Ægypt.*, *p.* 9, *Icon.* The قرظ (Karaz) of the Arabs and the صنط (Sant) of the Egyptians.

Acacia arabica, *Willd.*, *Roxb. Cor. Pl., t.* 149; *Bedd. Fl. Sylv., t.* 47. The bark.

Vernacular.—Babul, Kikar (*Hind.*), Kuruveylam (*Tam.*), Bábhúl (*Mar.*)

Description, Uses &c.—The bark is powerfully astringent and is used as a tonic internally; as a substitute for Oak bark it is issued to the Government hospitals and dispensaries in India. Externally a strong decoction of it is a useful astringent application to ulcers. The leaves and pods of the tree partake of the same properties, and are sometimes made use of by the natives. The gum has already been noticed in the article upon gum Arabic. Babul bark is hard and woody, of a rusty brown colour, having a tendency to divide into several layers. The external surface is rugged and fissured longitudinally, the internal smooth and fibrous; taste astringent and mucilaginous.

Acacia Catechu, *Willd.*, *Roxb. Cor. Pl.*, *t.* 175; *Bentl. and Trim.*, *t.* 95. Catechu.

Vernacular.— Khair (*Hind.*, *Bomb.*, and *Beng.*), Vodalai, Vodalam (*Tam.*)

Catechu, Katha, Kath (*Hind.* and *Bomb.*), Kattakambu (*Tam.*)

History, Uses, &c.—Sanskrit writers under the name of Khadira mention two kinds of catechu, dark and pale, both prepared from the wood of the Acacia Catechu, and these two kinds are still to be found in common use. The dark acacia catechu as sold in Bombay is in flat cakes of a dark brown colour and shining fracture, or in square cakes known as box catechu. The light catechu is a porous earthy-looking substance, somewhat laminated and much more friable than the dark; it is used for chewing with betel leaves and areca nut, while the use of the dark kind is confined to industrial purposes. Dark catechu is made by evaporating a decoction of the wood until it becomes solid; in making the light kind the inspissation is stopped at a certain point, and the catechu is obtained as a deposit upon twigs which are placed in the liquid extract. The Hindus consider catechu to be astringent, cooling, and digestive, useful in relaxed conditions of the throat, mouth, and gums, also in cough and diarrhœa. Externally they use it as an astringent and cooling application to ulcers, boils, and eruptions on the skin. A number of compound formulæ for its adminstration will be found in Chakradatta, Sarangadhara, and the Baisajya Ratnávali. Mahometan writers describe dark and light acacia catechu, and their use in medicine for the purposes already mentioned. An account of the introduction of catechu into Europe will be found in the Pharmacographia (p. 213). Other kinds of the drug which are imported into Bombay by sea will be found described in the article upon Gambier. The gum of A. Catechu has been noticed in the article upon Gum Arabic. In the Concans the juice of the fresh bark is given with Asafœtida in hæmoptysis, and the flowering tops with cummin, milk and sugar in gonorrhœa.

Description.—Dark acacia catechu or Cutch has a shining, bubbly and slightly granular fracture; it is of a dark brown colour, and sometimes soft interiorly when fresh, in this condition it may be drawn out into a thin translucent orange-brown film in which with a microscope acicular crystals of catechuic acid may be seen. Pale catechu occurs in irregular, laminated fragments of a porous, opaque, earthy appearance; it is of a light pinkish-brown colour, and easily fractured. Examined under the microscope it is seen to be almost entirely composed of minute acicular crystals of catechuic acid.

Chemical composition.—According to the Pharmacographia dark catechu (which is the only kind exported to Europe), when immersed in cold water turns whitish, softens and disintegrates, a small portion of it dissolving and forming a deep brown solution. The insoluble part is catechin or catechuic acid in minute acicular crystals. If a little of the thick chocolate-like liquid made by macerating Cutch in water is heated to the boiling point, it is rendered quite transparent (mechanical impurities being absent), but becomes turbid on cooling; ferric chloride forms with this solution a dark green precipitate, immediately changing to purple if common water or a trace of free alkali be used; dilute acids throw down a precipitate. Ether extracts from Cutch, catechin. This substance has been shown to have the formula $C^{13} H^{12} O^{5}$, and to be a compound of phloroglucin, $C^{6} H^{6} O^{3}$, and æscylic alcohol, $C^{7} H^{8} O^{3}$, less $H^{2} O$. Catechin dehydrated by drying over oil of vitriol, and then treated with an acid, loses $H^{2} O$, and is converted into brown, amorphous catechuretin.

An aqueous solution of catechin does not precipitate a solution either of gelatin, emetic tartar, or of a vegetable alkaloid. Lowe, by exhausting Cutch with cold water, and then agitating the solution with ether, obtained upon the evaporation of the latter, a yellow crystalline substance, which he ascertained to be quercetin, $C^{27} H^{18} O^{12}$.

When Cutch is subjected to dry distillation it yields pyrocatechin, $C^{6} H^{6} O^{2}$.

Commerce.—Acacia catechu for use with pán-supári is largely prepared about Surat. Value, Rs. 20 per maund of 37½ lbs. Cutch fetches from Rs. 4 to 5 per maund.

KHERSAL.—From the wood of Acacia Catechu is obtained a substance which I have not seen any notice of in works on Indian Materia Medica. Khersal or catechuic acid is obtained from cavities in the wood, and occurs in small irregular fragments like little bits of very pale catechu mixed with chips of reddish wood. This drug is collected by men who split firewood, and fetches a high price, as it is only occasionally met with; it has a sweetish very feebly astringent taste, and under the microscope is seen to be composed of minute needle-shaped crystals. When placed in water the colouring matter of the particles of wood mixed with the drug colour the water red, but the Khersal remains undissolved; in boiling water it is completely soluble, but is thrown down in conglomerate masses of small needle-shaped crystals upon the water cooling; it is also soluble in rectified spirit, and is deposited in the same form on the spirit evaporating. In native practice this substance is valued as a remedy in chest affections; it is thought to promote expectoration.

KATHBOL—Is a mixture of catechu and myrrh, which is frequently given to women after confinement as a tonic, and to promote the secretion of milk.

Acacia pennata, *Willd., Bot. Mag., t.* 3408. *A. prensans.*

Vernacular.—Shamí, Shembi (*Bomb.*)

A scandent shrub; prickles scattered, numerous, straight, or at length recurved; pinnæ 8 to 20 pair; leaflets beyond 30 pair, narrow linear, glabrous; heads of flowers globose-panicled; legume glabrous, or reddish with fine tomentum, common in the Concan. The bark is an article of commerce, being used to tan fishing nets; it occurs in strips about 3 feet long. In the Concan the leaf-juice mixed with milk is given to infants who suffer from indigestion of milk with black stools.

In bleeding from the gums the leaves are chewed with cummin and sugar; they are also rubbed to a pulp and mixed with cow's milk, cummin and sugar as a remedy for scalding of the urine. The dose is 2 tolás.

Acacia concinna, *D. C., Prodr. II.* 464. The pods.

Vernacular.—Sikekai, Shíka (*Bomb.* and *Tam.*), Kochai (*Beng.*)

Description, Uses, &c.—These pods are much used as a detergent for washing the head in Bombay. Ainslie has the following notice of their medicinal use in Southern India:—"Sheeakai is the name given by the Tamools to a long flat pod, or legume, containing separate, small, oval, dark-coloured seeds, and which is considered by the native practitioners as a most valuable medicine; in taste it somewhat resembles the soap-nut, but is more acid, less bitter, and has a singular pungency; its qualities are allowed to be deobstruent and detergent, and, I am inclined to think, expectorant; it is commonly ordered in cases of jaundice and other biliary derangements, and is besides used by the Indians like soap-nut for washing the head. The small leaves of the prickly shrub have a pleasant acidity, and are frequently put into pepper-water when it is found necessary to keep the bowels open or work off bile. The pod is usually prescribed in electuary in doses of about the size of a small walnut, every morning for three successive days." It is remarkable that this legume should have the same medicinal properties ascribed to it as the soap-nut (Sapindus trifoliatus).

Commerce.—Value, Re. 1½ to 1¾ per maund of 37½ lbs. The pods are imported from Canara, as well as the bark, which is used in tanning.

Albizzia amara *Boivin., Roxb. Cor. Pl., t.* 122.

Vernacular.—Lallei (*Bomb.*)

History, Uses, &c.—This tree, as well as A. Lebbek and A. odoratissima, has a medicinal reputation. Hindu writers describe it as cooling and useful in inflammatory affections, the oil of the seeds is given in white leprosy, and the powdered seed as an astringent; the flowers and leaves are applied in local inflammations, such as boils, erysipelas, &c.

Description.—A tree, branchlets and petioles tomentose; pinnæ 7 to 11 pair, approximated; leaflets many pair, small, oblong, linear falcate; peduncles in the upmost axils, fasciculate, subracemose; heads 12 to 20—flowered; ovary stipulate, glabrous. (*Bomb. Flora,* p. 88.) The Albizzias yield an inferior gum. Four species are noticed as medicinal in the Calcutta Exhibition Catalogue of 1883-84.

Hardwickia binata, *Roxb., Bedd. Fl. Sylv., t.* 255. The oleo-resin.

Vernacular.—Anjan (*Hind. and Bomb.*), Acha, Alti (*Tam.*)

Description, Uses, &c.—I notice this tree, although the oleo-resin is not known or used in Bombay, because it grows in Canara, the southernmost part of the Presidency, and because the oleo-resin has been used medicinally in Southern India. The following account of it has been extracted from the Pharmacographia:—"The tree, which is of a large size, belongs to the order Leguminosæ, and is nearly related to Copaifera. According to Beddome, it is very common in the dense, moist forests of the South Travancore Ghâts, and has also been found in South Canara. The natives extract the oleo-resin in exactly the same method as that followed by the aborigines of Brazil in the case of copaiba; that is to say, they make a deep notch reaching to the heart of the trunk, from which, after a time, it flows out.

"This oleo-resin, which has the smell and taste of copaiba, but a much darker colour, was first examined by one of us in

1865, having been sent from the Indian Museum as a sample of wood oil; it was subsequently forwarded to us in more ample quantity by Dr. Bidie of Madras. It is a thick, viscid fluid, which, owing to its intense tint, looks black when seen in bulk by reflected light; yet it is perfectly transparent. Viewed in a thin layer by transmitted light, it is light yellowish-green, in a thick layer vinous-red, hence is dichromic. It is not fluorescent, nor is it gelatinized or rendered turbid by being heated to 130° C., thus differing from Wood Oil. Broughton, who has investigated it chemically, obtained by prolonged distillation with water an essential oil to the extent of 25 per cent. from an old specimen, and of more than 40 per cent. from one recently collected. The oil was found to have the same composition as that of copaiba, to boil at 225° C., and to rotate the plane of polarization to the left. The resin is probably of two kinds, of which one at least possesses acid properties. Broughton made many attempts, but without success, to obtain from the resin crystals of copaivic acid.

"The balsam of Hardwickia has been used in India for gonorrhœa, and with as much success as copaiba." (Pharmacographia, p. 205.)

Astragalus sp. ? Sarcocolla.

Vernacular.—Anzerút (*Arab.* and *Pers.*), Gújar (*Bomb.*)

History, Uses, &c.—This drug, though still largely used in the East, is hardly known in Europe at the present time. Dioscorides informs us that Sarcocolla is the tear of a Persian tree, that it resembles powdered Frankincense, is of a reddish colour and bitterish taste, has the property of closing wounds and checking discharges from the eyes. It is an ingredient in plasters, and is adulterated with gum.*

Pliny writes to the same effect, and adds that it is valued by painters.† Ibn Sina says that it closes wounds without causing irritation and promotes granulation; used as plaster it mitigates all kinds of inflammation.

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* Dios. iii., 90. *περὶ σαρκοκόλλας.*

† Plin. 13, 11; 24, 14.

Masíh adds that it is cathartic and useful for the expulsion of phlegm and corrupt humours.

Amongst modern writers, Mír Muhammad Husain, the author of the Makhzan-el-Adwiya, informs us that Anzerút is at Ispahan called Kunjud and Agardhak, at Shiraz Kunderú; in Arabic it is known as Kohl-Fársi (Persian collyrium) and Kohl-Kirmáni (Kirman collyrium). The Indians call it Lai. He describes it as the gum of a thorny plant called Shayakah, which is about 6 feet high, has leaves like those of the Frankincense, and is a native of Persia and Turkistan; he then gives a correct description of the drug, and states that it is aperient, and a resolvent of corrupt and phlegmatic humours, &c.; it acts best when combined with such medicines as turpeth, myrobalans, sagapenum, &c. Speaking of particular diseases in which it is employed, he mentions its use in congestive apoplexy combined with castor oil, and topically in purulent discharges from the eyes;* roasted with onions it is dropped into the ear to cure earache. It is also used internally as an antirheumatic and anthelmintic. The Egyptian women eat it on account of its fattening properties. Dose, ½ to 2 miskáls; large doses are said to prove fatal by obstructing the intestinal glands. With regard to its use in plasters his remarks are to the same parport as those of Ibn Sina. When used as a collyrium he directs it to be prepared by being beaten up in ass's milk, and afterwards dried in an oven until slightly baked.

European writers on Materia Medica briefly notice Sarcocolla. Guibourt remarks that if the statements of the Greeks and Arabians are correct, it cannot be the produce of a Penœa, a genus confined to Africa. He states that Pelletier found it to consist of Sarcocolline 65·30, Gum 4·60, Gelatinous matter 3·30, Woody matter, &c., 26·80. Sarcocolline is described as a substance *sui generis* soluble in 40 parts cold water, 25 parts boiling, a hot saturated solution precipitates on cooling part of the Sarcocolline, which separates as a syrupy liquid and is no longer soluble in water. Alcohol dissolves it in all proportions, the solution mixed with water becomes turbid, but does not precipitate.

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* In the Tibb-i-Akbari the following receipt is given:— Starch 6 parts, Anzerút and white lead of each 2 parts; sift very fine for an eye-powder.

Description.—Sarcocolla consists of more or less agglomerated very friable grains; it is opaque or semi-transparent, and varies in colour from deep red to yellowish white or grey; it has hardly any odour and a sharp bitter sweet taste; it swells when heated, and burns with an odour of burnt sugar. Gum Sarcocolla is imported into Bombay from the Persian port of Bushire in bags which contains about 2 cwts.; the total quantity imported must be considerable, as from 12 to 20 bags may often be seen in a single warehouse. The original packages always contain portions of the plant, of which the following is a description:—

Fruit.—Peduncles short, slender; calyx oblong, bell-shaped, chaffy, $\frac{3}{4}$ in. long, with a 5-dentate narrow, open mouth, within it are the dry petals, and an oblong, silicious, rostrated pod, as large as a grain of rice in the husk, and having its external surface thickly covered with a felting of white, cotton-like down, consisting of long simple hairs matted together. Although the pod is mature, the petals remain firmly attached, the upper one is hooded and envelopes the rostrum of the pod. The pod is two-valved; attached to its dorsal suture on one side is a single, greyish-brown, vetch-like seed, having a diameter of $\frac{1}{8}$ inch; when soaked in water it swells, bursts, and a mass of Sarcocolla protrudes; some of the pods are abortive and are full of the gum. Stem.—Woody, composed of numerous radiating, wedge-shaped bundles, thorny; thorns $\frac{3}{4}$ to 1 inch long, and together with the young branches more or less covered with cotton-like down, and encrusted with Sarcocolla; no leaves were found.

Several handfuls of the fruit may be picked from a bale of gum, but most of it has lost its chaffy calyx from friction. As leaves are never seen it is probable that the Sarcocolla is collected by beating the bushes after the leaves have fallen. The exudation must be so abundant as to flow on the ground, as masses of sand, glued together by it, of large size, are found in the packages. I think there can be little doubt that the plant is one of the desert Legumenosæ, not far removed from the genus Astragalus.

Commerce.—The average value of Sarcocolla is Rs. 3 per maund of 37½lbs. It is rather an important medicinal article in Bombay, as it is one of the principal ingredients of the *lép* (plaster), which the Parsee bone-setters use in combination with cotton to form a support to fractures or sprains, and also to weak joints. The usual composition of *Lép* is Sarcocolla 9 parts, Jadvar 1, Socotrine Aloes 16, Alum 8, Maida-lakri 4, Singapore Dammer 4, Frankincense 7, Ambehalad 7, and Gamboge 12 parts. These ingredients are reduced to a fine powder and then rubbed into a paste with water by means of a stone and muller.*

Trachylobium Hornemannianum, *Hoyne. Vernacular.*—Sandarús. Gum Copal is administered internally in native practise as an astringent, anthelmintic, diuretic and emmenagogue; with honey it is applied to remove opacities of the cornea, with olive oil it is dropped into the ear in earache, made into an ointment it is applied to wounds to promote granulation, the fumes are inhaled in catarrh; made into an ointment with pitch it is applied to ringworm. In Ajmere fine shavings of the gum made up into a medicine called Khairva are used to stop hæmoptysis. (Irvine Med. Top., p. 132.) The gum is too well known as an article of commerce to require description.

Bakila.—There appears to be little reason to doubt that these are the seeds of Vicia faba, which is a native of Persia, and extensively cultivated in Europe; in England they are well known as Horse beans. The hakíms administer them as a nutritive tonic for rendering the body fruitful (تخصيب البدن), and consider them to be deobstruent and expectorant; the roots are diuretic. The author of the Makhzan give κύαμος and several other synonyms for them, and fully describes the various uses to which they are put. (Confer. article Bákila.)

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* Compare with the malgamata of the Greeks and Romans. Scrib. Comp. 258, *et seq.*

Turmus or **Bakila-i-Misri**.—It is almost certain that these are the seeds of Lupinus albus; they are used by the hakíms as a deobstruent, alterative and anthelmintic. L. albus is a native of Egypt, and is now very extensively cultivated in Italy and other Mediterranean countries for forage and for its seeds, which when boiled, so as to remove their bitterness, form an article of food in some districts. The seeds contain an alkaloid (Lupinine) which has a very bitter taste, and is poisonous to frogs, but apparently not deleterious to man, even if given in rather large doses. (Confer. Gazz. Chim. Ital., XI., 237, 240.) A full account of the properties of the drug will be found in the Makhzan (article Turmus).*

ROSACEÆ.

Amygdalus communis, *Linn., Bentl. and Trim., t.* 99. Almonds.

Vernacular.—Bádám (*Hind.* and *Bomb.*), Vádam-kottai (*Tam.*); Bitter, Kurwe-bádam (*Hind.* and *Bomb.*), Kashappu-vadam-kottai (*Tam.*), Louz-el-mur (*Arab.*)

History, Uses, &c.—Almonds are mentioned in the Book of Genesis as having been carried into Egypt from Palestine as a present by the sons of Israel; they are frequently noticed by

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* تُرْمُس Turmus, vulgarly pronounced Tirmis, from the Greek θέρμος, or Coptic θαρμος. Conf. Theophr. H. P. viii., 11. They were used by the Greeks to counteract the effects of drink, and must not be confounded with the κύαμος ἀιγυπτίος or Coptic Bean, the seed of the Nelumbium.

Theophrastus; Dioscorides* describes the use of the root, seeds and gum of the bitter almond tree as medicinal agents. Pliny also was acquainted with almonds and the almond tree ἀμυγδαλή amygdala).† He as well as Celsus and Columella, speak of 'nux amara,' 'the bitter almond'; almonds were also called Avellanæ Græcæ and Nuces Græcæ by Latin writers. Much interesting information having regard to the ancient history of Almonds in Europe may be found in the Pharmacographia. In India the Almond, though probably indigenous to Cashmere and the Himalayas, does not appear to have attracted the same attention as in Europe. In some Sanskrit works it is mentioned under the name of Bádáma, the same name which it bears in Persia, where the the tree is very common and the fruit much used. When the Mahometans settled in India, Almonds were probably for the first time introduced into the southern and central parts of the country as an article of commerce from Persia. Arabic and Persian writers on Materia Medica discuss their properties at considerable length. The uses to which they put sweet Almonds are essentially the same as with us.

The author of the Makhzan-el-Adwiya mentions two kinds of sweet Almond, the thick-shelled and the thin (or Kaghazí). He describes the method of extracting the perfumes of flowers by means of Almonds placed in contact with them, and says that the oil being afterwards expressed retains the perfume of the flower. He also notices the use of the burnt shells as tooth powder, and of the unripe fruit (Chugala) as an astringent application to the gums and mouth. Bitter Almonds are described by Mahometan writers as attenuant and detergent; they are recommended both internally and externally for a variety of purposes. As a plaster made with vinegar they are used to relieve neuralgic pains; as a collyrium, to strengthen the sight; in emulsion with starch and peppermint, to allay cough. They are also considered to be lithontriptic and diuretic, and of use for removing obstructions of the liver and spleen; applied to the head they kill lice; as a suppository they relieve pain in difficult menstruation; as a poultice they are a valuable application to irritable sores and skin eruptions. The root of the tree is described as discutient and alterative; it is used both internally and externally. The gum, with that of the plum tree, which is known in Bombay as "Badámi gond," is one kind of Hog gum or Gum Bassora of European commerce, and is used in the East as a cheap substitute for more soluble gums. The oil of Almonds is not an article of commerce in Bombay.

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*Dios. i., 144. †Plin. 12, 9; 13, 11; 16, 26.

Description, &c.—For a description of the fruit I must refer the reader to standard works on Materia Medica. Persian Almonds are inferior in appearance to Jordan Almonds; they may be classed with those known in London as Valencia and Sicily. Almonds should have a perfectly bland, sweet, nutty flavour when the outer brown skin has been removed. They contain no starch; the skin is astringent from the presence of tannic matter.

Chemical composition.—The reader is referred to the Pharmacographia and other standard works on Materia Medica.

Commerce.—Almonds are imported into Bombay from the Persian Gulf in large quantities (16,000 to 20,000 cwts. annually). Value, Abushahrí, Rs. 4 per Surat maund of $37\frac{1}{2}$ lbs.; Kaghazí (thin shelled), Rs. 12; Bunderí, of handsome appearance but having small kernels, Rs. $3\frac{7}{8}$th; Asmaní, Rs. $3\frac{6}{8}$. Almonds are also imported into India from Cabul.

Prunus Bokariensis, *Royle, Ill.*, 205. The fruit.

Vernacular.—Alú-Bokhárá (*Hind., Bomb.* and *Pers.*), Alpogáda-pazham (*Tam.*)

Description, Uses, &c.—The Bokhara plum in a dry state is commonly met with in Indian bazars, being used much as prunes are with us in Europe. It may be considered the officinal prune of India, and may be made use of in the preparation of confection of Senna, and for any other purpose to which prunes are applicable. The author of the Makhzan-el-Adwiya,* after noticing several kinds of plum which are common in Persia and the neighbouring countries, goes on to say that for medicinal purposes the amber-coloured Bokhara plum is to be preferred. He describes it as sub-acid, cold and moist, digestive and aperient, especially when taken on an empty stomach, useful in bilious states of the system and heat of body. The root he says is astringent, and the gum a substitute for Gum Arabic, and often called Persian gum. He also notices the wild plum (probably P. spinosa), and says that a kind of dry cake is prepared from the pulp, and used medicinally on account of its acid and astringent qualities; and an astringent kind of plum from Damascus which the Turks call Fakúmílás, evidently a corruption of the Greek κοκκυμηλέα (conf. Dioscorides i., 142), who describes prunes as coming from Damascus.

The Bokhara plum as met with in commerce is about the size and shape of the dry prune of Europe, but of a lighter colour, showing, that in the fresh state it must have been yellow or green and not purple; it is very acid, but on the addition of a little sugar the taste is agreeable and refreshing. Prunes contain free malic acid, sugar, and albuminoid and pectic substances; what the supposed laxative principle is has not been determined. I have not met with any chemical examination of the particular kind under notice.

Commerce.—The imports of Alú Bokhárá into Bombay are considerable, as it is much used as an article of diet. Value, Rs. 8 to 12 per Surat maund of 37½ lbs. The price varies with the quantity in the market; there is but little difference in quality.

Prunus Mahalib, *Linn. Vernacular.*—Gávala or Gahula (*Bomb.*), Mahalib (*Sind*).

Prunus Pudum, *Roxb.*, *Wall. Pl. As. Rar. ii.*, 37, *t.* 143. Padma-kasta (*Bomb.*)

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* Conf. Makhzan, article اجاص

These two articles evidently belong to the cherry tribe, and are imported into Bombay from Northern India or from Arabia or Persia. The first consists of the Almonds of Prunus mahalib, amongst which a few entire stones are found; these have very fragile shells of a pointed oval shape, about 4-10ths of an inch long and 2-10ths broad; the Almonds are of a pale buff colour, the skin thin and marked with longitudinal veins; they have a strong prussic acid flavour, and are the محلب of Arabian writers.

The second consists of the smaller branches of a kind of cherry, three-quarters of an inch or less in diameter, the bark of which evidently contains amygdalin; both articles are commonly met with in the shops, and serve as substitutes for prussic acid in native practise.

Alubalu.—Under this name the stones of a cherry are sold for medicinal purposes. The kernel contains the elements of hydrocyanic acid. It is considered by the hakíms to strengthen the nervous system. It is the Karásia of Mahometan writers, and the *κεράσια* of the Greeks.* آلوبالو is a vulgar corruption of آلوبوعلی Alu-Bu-Ali.

Hagenia Abyssinica, *Lamarck, Bentl.* and *Trim., t.* 102. The flowers.

Vernacular.—Kousso (*Bomb.*)

History, Uses, &c.—This drug appears not to have been known in India until within the last quarter of a century, when a demand for it in Europe having sprung up, it began to be imported into Bombay from Abyssinia *via* Aden. The use of the flowers as an anthelmintic by the Abyssinians was first made known by Bruce in 1773. In 1811 the plant was described by Lamarck, who named it Hagenia, in honour of Dr. Hagen of Königsberg. The name of Brayera, which it also bears, was given it in honour of Brayer, a French physician of Constantinople, who wrote a pamphlet upon its use as an anthelmintic. In 1850 it was introduced into Europe, and in 1864 it became official in the British Pharmacopœia. At the present time the imports into Bombay are declining, and there appears to be very little demand for the drug in Europe. M. W. Schimper, Governor of Adoa, in an excellent article upon Cousso, mentions several other vermifuges used by the Abyssinians—viz., *Habbi-tchogo,* bulbs of Oxalis anthelmintica; *Habbi-tsalim,* Jasminium floribundum; *Bolbidá,* Celosia adoensis; *Musenna* or *Muséna,* bark of Albizzia anthelmintica, from which M. Thiel has extracted *Musénine*; *Saoria,* seed of Maesa picta or lanceolata; *Angogo* or *Ogkert,* Silene macrosolen; *Tatzé* or *Zareh,* fruit of Myrsine africana.

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* Dios. 134.

Description.—As imported into Bombay Kousso varies a good deal in appearance; sometimes parcels are met with which consist almost entirely of long panicles of flowers, in others the panicles are quite broken up, and few of the flowers even remain entire. The panicle consists of a zigzag stalk, which is much branched and thickly-covered with simple and glandular hairs; the branches are provided with large bracts, and at the base of each flower are two or three smaller ones, between which is the turbinate hairy calyx, having 10 sepals arranged in a double row. The female flowers are larger than the male, being as much as half an inch in diameter; the petals are small and linear, inserted with the stamens in the throat of the calyx; the sepals, which form the bulk of the drug, are veined and membranaceous, of a light brown colour, sometimes tinged with red.

Chemical composition.—The reader is referred to the Pharmacographia and other standard works on Materia Medica.

Commerce.—Kousso is brought to Bombay from Africa *via* Aden. Value, about Re. ½ per lb.

Rosa Damascena, *Miller, Laur. Ros., t.* 38. The petals, stamens and oil.

Vernacular.—Guláb-ká-phúl (*Hind.* and *Bomb.*), Guláppú, Irojáppú (*Tam.*), Gulap-phúl (*Beng.*)

History, Uses, &c.—Under the name of Ward, the following varieties of the Rose are noticed in Arabic and Persian works:—White Wild Rose, Red Wild Rose, Red Garden Rose, Wild Yellow Rose, Yellow Garden Rose, Dalík or Dog Rose, White Cluster Rose, and a wild Rose called Ward-el-Hamák, the petals of which are described as yellow outside and red within. Of these the red garden Rose appears to be the R. Damascena which is cultivated both in Persia and India for officinal purposes, and is the kind from which Rose Water and Oil of Roses are usually obtained. In India Rose buds are preferred for medicinal use, as they are more astringent than the expanded flowers; they are considered to be cold and dry, cephalic, cardiacal, tonic and aperient,* removing bile and cold humours; externally applied the petals are used as an astringent. The stamens are thought to be hot, dry and astringent, and the fruit is credited with similar properties. Notices of the fruit of Rosa canina will be found in Arabic works under the name of Dalík. The Rose stamens (Tukm-i-gul) of the shops are supposed to be derived from this plant. The following preparations made with the petals of R. Damascena are used as medicaments:—

Duhn-i-ward-i-khám.—A fatty oil made by exposing Rose leaves and sweet oil to the sun and then filtering.†

Duhn-i-ward-i-matbúkh.—A similar preparation made by heating the petals with sweet oil over the fire. Both of these oils are considered to be deobstruent, astringent and aperient; they are also recommended in poisoning by caustic alkalies.

Gulkand.—A conserve made from equal parts of Rose petals and white sugar beaten together; it is considered tonic and fattening, and is much used by women and old people. Sheikh-el-Raís says that he cured a consumptive young woman with it.

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* For an aperient, in the Concan, the dried buds are boiled with rice, and ghi and sugar are added.

† The *ῥόδινον ἔλαιον* of the Greeks. Conf. Dios. i., 44.

Gulangabín.—A similar preparation made with honey and considered to have much the same properties.

Guláb.—Rose water is largely used in native practice in much the same way as orange flower water is by the French.

Guláb-ka-attar.—Otto of Roses, having properties similar to those of Rosewater, is made in Persia and India, but not in sufficient quantity to supply the Indian market; a good deal has therefore to be imported from Turkey. Rose water is manufactured in Bengal and the Punjab, and a large quantity is imported from Persia. An account of the preparation of rose water and otto at Gházípúr in Bengal will be found in the Bengal Dispensatory. It appears that the common native still is used (this is simply a rough form of alembic without a condensing worm), and that one hundred thousand roses produce about 100 bottles of rosewater. Otto is only made in cold weather. To obtain it the rose water is exposed to cold in shallow vessels, a thin film forms upon the surface, and is removed with a feather. One hundred thousand roses are estimated to produce about 180 grains of otto. Otto is said to have been first discovered in India by Núr-i-jehán Begum in 1612. On the occasion of her marriage with the Emperor Jehángír, the Queen is said to have observed a scum upon the surface of the Rosewater with which the canals in the gardens of the palace had been filled, and ordering it to be collected found it to have a delicious fragrance. For an interesting history of otto and its introduction into Europe the Pharmacographia may be consulted.

Description.—R. Damascena is a shrubby plant, with numerous unequal strong prickles, dilated at the base; leaflets 5 to 7, ovate, stiffish; flower-bud oblong, sepals deflexed after the flowers have opened; tube elongated, often dilated at the top; fruit ovate, pulpy; calyx and peduncles glandulosely hispid, viscous; colour of flower light red.

Chemical composition.—The following account is taken from the Pharmacographia:—"Rose oil is a mixture of a liquid constituent containing oxygen, to which it owes its perfume, and a solid hydrocarbon or stearoptene, which is entirely destitute of odour. The proportion which these bodies bear to each other cannot be exactly determined, but is certainly extremely variable. From the Turkish oil, it may be obtained to the extent of 18 per cent., and from French and English to 35, 42, 60 or even 68 per cent.

"Though the stearoptene can be entirely freed from the oxygenated oil, no method is known for the complete isolation of the latter. As obtained by Gladstone, it had a sp. gr. of 0·881 and a boiling point of 216° C.

"With regard to the stearoptene of Rose oil, the analysis of Théodore de Saussure (1820) and Blanchet (1833), long since showed its composition to accord with the formula $C^n H^{2n}$. The experiments of one of us confirm this striking fact, which assigns to the stearoptene in question a very exceptional place among the hydrocarbons of volatile oils, all of which are less rich in hydrogen.

"Rose stearoptene separates when otto of Rose is mixed with spirit of wine. We have isolated it also from oil obtained from Mitcham Roses, by dissolving the oil in chloroform and precipitating with spirit of wine, the process being several times repeated. The stearoptene was lastly maintained for some days at 100° C.; thus obtained, it is inodorous, but when heated evolves an offensive smell like that of heated wax or fat. At 32·5° C. it melts; at 150° C. vapours are evolved; at 272° C. it begins to boil, soon after which it turns brown and then blackish. Stains of the stearoptene on paper do not disappear by the heat of the water-bath under a lapse of some days.

"If cautiously melted by the warmth of the sun, stearoptene forms on cooling microscopic crystals of very peculiar shape. Most of them have the form of truncated hexahedral pyramids, not however belonging to the rhombohedric system, as the angles are evidently not equal; many of them are oddly curved, thus §. Examined under the polarizing microscope, these crystals from their refractive power make a brilliant object.

"Rose stearoptene is a very stable body, yet by boiling it for some days in fuming nitric acid, it is slowly dissolved, and converted into various acids of the homologous series of fatty acids, and into oxalic acid; perhaps likewise partly into fumaric acid. Among the former, we detected butyric and valerianic. The chief product is, however, succinic acid, which we obtained in pure crystals, showing all the well known reactions.

"The same products are obtained even much easier, by treating paraffin with nitric acid; it yields however less of succinic acid. The general behaviour and appearance of paraffin is in fact nearly the same as that of Rose stearoptene. But what is called *paraffin*, is a series of extremely similar hydrocarbons answering to the general formula $C^{n} H^{2n} + {}^{2}$ (^{n} being equal to more than 16), the separation of which has not yet been thoroughly effected. The fusion point of the different kinds of paraffin generally ranges from 42 to 60° C., yet one sort from the bituminous shale of Autun, prepared and examined by Laurent, melts at 33° C., and in this respect agrees with our stearoptene. It is therefore possible that the latter actually belongs to the paraffin series.

"We have not ascertained the correctness of Baur's strange experiments (1872, Jahresbericht der Pharm., p. 460), by which he believes he has converted the liquid part of rose oil into the stearoptene by means of a current of hydrogen." (*Op. cit.*, 2nd Ed., p. 266.)

Commerce.—The Bombay market is supplied with dry Roses from the Deccan; both buds and expanded flowers arrive together, and are valued at about Rs. 4½ per Surat maund of 37½ lbs. In Bombay the buds are separated and sold for Rs. 7 per maund. The expanded flowers are worth only Rs. 3 per maund, and are purchased for the preparation of Gulkand. Rosewater to the extent of 20,000 to 30,000 gallons annually is imported from the Persian Gulf; two qualities are met with, Yak-atishí (once distilled) and Du-atishí (twice distilled). Value, Rs. 4 to Rs. 4½ per carboy of 20 lbs.

Otto of Roses is imported from Persia and Turkey. Value, Rs. 10 to 12 per tolá of 180 grains.

Adulterations.—Much of the Persian Rosewater is diluted with water in Bombay before it is sold. Pure otto is hardly to be obtained; it undergoes adulteration before it is shipped to Bombay, and on arrival is still further falsified by a large admixture of Sandalwood oil reducing its value to from ½ to Rs. 2 per tolá.

I have been unable to ascertain that otto is ever adulterated with grass oil in Bombay, nor do the dealers in the latter article appear to know anything about its use in Turkey for this purpose.

Pyrus cydonia, *Linn.*, *Bentl. and Trim.*, *t.* 106. The seeds.

Vernacular.—Bihi-danah (*Hind.* and *Bomb.*), Shimai-madalavirai (*Tam.*)

History, Uses, &c.—The author of the Makhzan describes three kinds of quince (Safarjal)—the sweet, the sour and subacid, called in Arabic Muzz. The sweet and subacid quinces are commonly eaten as a fruit by the Arabs and Persians, and are considered cephalic, cardiacal and tonic; they are also eaten baked. The leaves, buds and bark of the tree are domestic remedies among the Arabs on account of their astringent properties. In Persian Karabádíns (Pharmacopœias), a number of receipts for making conserves, lozenges, &c., of the fruit, as well as a conserve of the flowers, will be found.* In India we only meet with the seeds as an article of commerce. They are considered cold, moist, and slightly astringent, and are one of the most popular remedies in native practise, the mucilage being prescribed in coughs and bowel complaints as a demulcent; externally it is applied to scalds, burns and blisters.

Description.—The quince resembles a pear in shape and size, when ripe it is of a golden yellow colour. The kind commonly cultivated in Europe is sour and astringent, but has an agreeable and aromatic smell. In Arabia and Persia sweet edible quinces are grown, and are commonly offered for sale as a fruit. In structure the quince differs from the pear in having numerous seeds in each cell, which cohere together by the mucilaginous membrane with which each seed is surrounded. The seeds are irregularly ovoid, flattened and three sided from mutual pressure. At the lower end is the hilum, from which the raphe extends as a straight ridge to the opposite extremity, which is slightly beaked and marked with a scar indicating the chalaza. The testa is of a dark brown colour, and encloses two cotyledons and a straight radicle directed towards the hilum. The kernel has the odour and taste of bitter almonds, but the testa is simply mucilaginous.

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* Conf. Dioscorides v., 20, *et seq*, for Quince Wine, Quince honey, &c. *κυδωνίτης οἶνος καί κυδωνόμελι*; κ.τ.λ.

Chemical composition.—According to the Pharmacographia, the mucilage of the epidermis is present in such quantity that the seed easily coagulates forty times its weight of water. By complete exhaustion, the seeds afford about 20 % of dry mucilage, containing considerable quantities of calcium salts and albuminous matter, of which it is not easily deprived. When treated with nitric acid, it yields oxalic acid. After a short treatment with strong sulphuric acid it is coloured blue by iodine. Tollens and Kirchner (1874), assign to it the formula $C^{18} H^{28} O^{14}$, regarding it as a compound of gum, $C^{12} H^{20} O^{10}$, and cellulose, $C^{6} H^{10} O^{5}$, less one molecule of water. Quince mucilage has but little adhesive power, and is not thickened by borax. That portion of it which is really in a state of solution, and which may be separated by filtration, is precipitable by metallic salts or by alcohol. The latter precipitate after it has been dried is no longer dissolved by water either cold or warm. Quince mucilage is, on the whole, to be regarded as a soluble modification of cellulose.

Commerce.—Quince seeds are imported into Bombay from the Persian Gulf and Afghanistan. Value, Rs. 10 to Rs. 25 per Surat maund of 37½ lbs., according to quality.

Potentilla supina, *Linn., Bertol. Plant. Nuov. Asiat.* 8, *t.* 4; *Jacq. Aus.* 5, *t.* 406.

Indigenous in Upper Sind and Afghanistan. The roots are employed as a febrifuge. (Murray.) The πεντάφυλλον of Dioscorides was a species of Potentilla, according to Sibthorp P. reptans. The medicinal properties of these plants depend upon tannin; they are astringent and tonic.

LYTHRACEÆ.

Ammannia baccifera, *Linn., Lam. Ill., t.* 77, *f.* 5.

Syn.—Ammannia vesicatoria.

Vernacular.—Dad-mari (*Hind.*), Aginbúti, Agiya, Guren, Bhár-jambúl (*Bomb.*), Kallurivi, Nirumel-neruppu (*Tam.*)

History, Uses, &c.—The properties of this plant and its use by the natives as a blistering agent appear to have been first brought to the notice of Europeans by Roxburgh. Ainslie quotes him, and remarks that the plant has a strong muriatic smell, but not disagreeable; the leaves are extremely acrid, and are used by the the natives to raise blisters in rheumatism, fevers, &c., the fresh leaves bruised and applied to the part intended to be blistered, perform their office in half an hour, and most effectually. The authors of the Bengal Dispensatory state that they made a trial of the leaves in eight instances; "blisters were not produced in less than twelve hours in any, and in three individuals not for 24 hours. The bruised leaves had been removed from all after half an hour. The pain occasioned was absolutely agonizing until the blister rose; they caused more pain than cantharides, and are far inferior to the Plumbago rosea in celerity and certainty of action." According to Fleming, the leaves are applied to cure herpetic eruptions. The authors of the Pharmacopœia of India merely notice the unfavourable opinion of the drug expressed in the Bengal

Dispensatory. I have made some experiments with an ethereal tincture of the leaves which leads me to form a much more favourable opinion of them; in several instances it blistered rapidly, effectually, and without causing more pain than the liquor epispasticus of the Pharmacopœia, which it resembles in colour. Upon evaporation of the ether a dark green resinous extract is left. A spirituous tincture was also tried, but it was not nearly so efficient. I have met with no mention of A. vesicatoria in standard native works on Materia Medica. Dr. Bholanath Bhose describes a mode of treatment of obstinate spleen disease by the juice of the leaves administered internally; but its administration in this manner has been objected to as causing pain and yielding uncertain results. In the Concan the juice is given with water to animals when in heat to extinguish sexual appetite; the plant fresh or dried is administered in decoction with ginger and Cyperus root for intermittent fevers, and its ashes are mixed with oil and applied to herpetic eruptions. The plant is common in low moist ground in the neighbourhood of Bombay, and appears in November and December. Its properties are retained after the plant has been dried.

Description.—An herbaceous, erect, much-branched plant, having something the foliage of rosemary; stems 4-sided; leaves sessile, opposite, lanceolate, attenuated, about an inch long and ⅛ inch broad, much smaller on the upper parts of the plant; calyx 4-cleft to the middle, lobes acute, accessory teeth very small; flowers very minute, aggregated in the axils of the leaves, almost sessile; tube of the calyx at first narrow and tightened round the ovary, in fruit cup-shaped; petals wanting; capsule longer than the calyx, 1-celled; flowers red. The whole plant has an aromatic and rather agreeable odour, which it retains when dry.

Chemical composition.—A resin is probably the active principle, but no examination has been made.

Woodfordia floribunda, *Salisb.*, *Roxb. Cor. Pl.*, *t.* 31; *Bot. Mag.*, *t.* 1906. The flowers.

Syn.—Grislea tomentosa.

Vernacular.—Dhái (*Hind.*), Dhaití, Dhaoshi (*Bomb.*), Dhaiphúl (*Beng.*), Serinjí (*Tel.*)

History, Uses, &c.—This shrub is very common in Khandesh, and is also found along the Ghauts and in the Concan. In Sanskrit it is called Tamrapushpi and Guchchapushpi, and is mentioned by Chakradatta and Sarangadhara on account of its astringent properties. As a medicine the flowers are chiefly prescribed by the natives in dysentery, beaten up with honey into a kind of confection. They are also thought to be of use in menorrhagia; externally they may be used as an astringent. The natives of the Concan in bilious sickness fill the patient's mouth with sesamum oil, and apply the juice of the leaves to the crown of the head, this is said to cause the oil in his mouth to become yellow from absorption of bile, fresh oil is then given repeatedly until it ceases to turn yellow. Commercially, the flowers are of considerable importance as a dyeing and tanning material.

Description.—The flowers and their calices are red, the latter are permanent, and retain their colour after the flower has faded. As met with in commerce the calices generally contain the nearly mature capsules, which are two-celled and two-valved and completely enclosed. The seeds are light brown, very minute, oblong and very numerous; if the calyx is soaked in water it will be seen to be 12-toothed. In ordinary samples of the article some of the flowers are in small racemes, and a good many lanceolate leaves with a whitish under surface studded with black dots are mixed with them; both sides of the leaf will, if examined with a lens, be seen to be covered by a close dense tomentum. The enlarged calices are very astringent, and evidently contain much tannic matter. No analysis appears to have been made.

Commerce.—The article is carried inland in large quantities. Value in Bombay, Rs. 15—25 per kandy of 5¼ cwts. The variation in price depends upon the quantity in the market.

Lawsonia alba, *Lam. Ill., t.* 296, *f.* 2; *Wight Ill., t.* 87; *Griff. Ic. Pl. Asiat., t.* 580. The leaves and flowers.

Vernacular.—Méhndí (*Hind.* and *Bomb.*), Marutonri, Aivanam (*Tam.*), Méhédi (*Beng.*), Iswan (*Belgaum*).

History, Uses, &c.—Henna is much esteemed by the Mahometans. There is a tradition that their Prophet spoke of it as "Syyadu riáhín" (the best of herbs). In Arabic it is called Hinna. Arabic and Persian works give Arkán and Fákúliyún as the Greek names;* they describe the leaves as a valuable external application in headache, combined with oil so as to form a paste, to which resin is sometimes added. They are applied to the soles of the feet in small-pox, and are supposed to prevent the eyes being affected by the disease. They also have the reputation of promoting the healthy growth of the hair and nails. An ointment made from the leaves is spoken of as having valuable healing properties, and a decoction of them is used as an astringent gargle. The bark is given in jaundice and enlargement of the spleen, also in calculous affections, and as an alterative in leprosy and obstinate skin diseases, in decoction it is applied to burns, scalds, &c. The seeds, with honey and tragacanth, are described as cephalic. An infusion of the flowers is said to cure headache, and to be a good application to bruises; a pillow stuffed with them has the reputation of acting as a soporific. (Dr. Emerson.) An ointment is also applied to bruises, and a perfumed oil is prepared from them, which is called in Arabic Duhn-el-fághiya, and is used as a cosmetic.

Ainslie notices the use of an extract prepared from the flowers and leaves by the Tamil physicians of Southern India as a remedy in lepra (leprosy?), half a teaspoonful twice a day being the dose. He also says that the leaves are applied externally in cutaneous affections. In the Concan the leaf-juice mixed with water and sugar is given as a remedy for spermatorrhœa, and with milk in the condition popularly known as "hot and cold fits."

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* The *κυπρος* of Dioscorides (i., 109,) appears to be Henna, as he says 'the leaves dye the hair of an orange colour.' If such a name as Fákúliyún occurs in any of the later Greek writers, it must be derived from the Persian فاغیه. Arkán. ارقان is an Arabic word meaning a blight or disease which turns plants or men yellow (jaundice).

In the Pharmacopœia of India attention is drawn to their use in an obscure affection called "Burning of the feet," often met with in India; and the editor mentions his having himself witnessed, when in Burmah, a great amount of temporary relief from the remedy when numerous other means had previously failed. The fresh leaves beaten up into a paste with vinegar were applied as a poultice to the soles of the feet in most cases, but some patients obtained greater relief from using strong frictions with the bruised leaves over the part.

The use of Henna for dyeing the hands and feet appears to be common among Mahometans in Asia and Africa, and was probably practised by the ancient Egyptians and Jews. The Hindus in Western India hardly ever use it. Sir G. Birdwood has the following remarks upon its history in more Western countries:—"Solomon is supposed by Sprengel to refer to the Henna plant in his Epithalamium (I. 14), 'My beloved is unto me as a cluster of Samphire (or Cypress or Camphire) in the vineyards of Engedi." It is undoubtedly the κυπρος of Dioscorides and "Cyprus in Egypt" of Pliny. It is mentioned by Avicenna also under the name of "Henna."

Description.—Leaves opposite, smooth, short petioled, oblong, or broad lanceolate, pointed at both ends, an inch or more long and less than half an inch broad; the flowers are in terminal, globular, cross-armed panicles, small, greenish white and very fragrant; the fruit is round, the size of a pepper-corn, four-grooved, with the apex depressed, four-celled; the seeds are angular. The decoction of the leaves is of a deep orange colour, which is destroyed by acids, and deepened by alkalies and vegetable astringents; it stains the skin of an orange red colour, which does not disappear until the epidermis has been renewed.

Chemical composition.—The colouring matter of Henna is a kind of tannin to which M. Abd-el-Aziz Herraory has given the name of Hennotannic Acid. This principle is brown, of a resinoid appearance, and soluble in boiling water. It possesses the properties of tannin, such as blackening the sesqui-salts of iron, and precipitating gelatine. It reduces oxide of copper in Trommer's test, and heat decomposes it, with the evolution of crystalline needles, which reduce nitrate of silver. (Jour. de Pharmacie, Jan. 1863.)

Punica granatum, *Linn.*, *Bentl.*, and *Trim.*, *t.* 113. The fruit, rind, and root bark.

Vernacular.—Anár (*Hind.*), Dálim (*Beng.*), Dárim (*Bomb.*), Mádalai (*Tam.*); the flowers, Julnár, Gulnár (*Arab.*, *Pers.*, *Hind.* and *Bomb.*), Pumadalai (*Tam.*)

History, Uses, &c.—The pomegranate which by Dierbach's account is the *Ροα Σίδη* of Hippocrates, is a native of the South of Europe, Arabia, Japan, Persia, and Barbary. It is now much cultivated in India, but the Indian fruit is greatly inferior to that which is imported from the Persian Gulf ports. The Sanskrit name is Dádima. Hindu physicians prescribe the juice of the ripe fruit combined with saffron as a cooling medicine. They also use the rind of the fruit and the flowers, combined with aromatics, such as cloves, cinnamon, coriander, pepper, &c., as an astringent in such bowel affections as are not accompanied with tenesmus. In the Concan the juice of the green fruit, rubbed with Galls, Cloves and Ginger is given in honey as a remedy for piles. The juice of the flowers with Durva root juice (Cynodon dactylon) is used to stop bleeding from the nose. The root bark does not appear to be mentioned in any Sanskrit works on Materia Medica. The Arabs call the pomegranate Rumán, Anár is the Persian name. Mahometan writers describe three kinds, sweet, sour, and subacid (the Rumán-i-barí of these writers is not a pomegranate). Besides using the flowers and rind in a variety of ways on account of their astringency, they recommend the root bark as being the most astringent part of the plant, and a perfect specific in cases of tapeworm; it is given, in decoction, prepared with two ounces of fresh bark, boiled in a pint and a half of water till but three-quarters of a pint remain; of this when cold a wineglassful may be drunk every half hour, till the whole is taken. This dose sometimes sickens the stomach a little, but seldom fails to destroy the worm, which is soon after passed.*

The seeds of the pomegranate are considered to be stomachic, the pulp cardiacal and stomachic. It would appear that the Arabs derived their knowledge of the medicinal qualities of this plant from the Greeks, as a similar account of them is found in Dioscorides. The balaustium of Dioscorides and Pliny is the double pomegranate flower, a word which in the corrupted form of Balusitún is common in Arabic and Persian books.† The root bark and rind of the fruit are officinal in the Pharmacopœia of India.

Description.—The following description is extracted from the Pharmacographia:—"The fruit of the pomegranate tree is a spherical somewhat flattened and obscurely six-sided berry of the size of a common orange, and often much larger, crowned by the thick, tubular, 5 to 9-toothed calyx. It has a smooth, hard, coriaceous skin, which when the fruit is ripe, is of a brownish yellow tint, often finely shaded with red. Membranous dissepiments, about 6 in number meeting in the axis of the fruit, divide the upper and larger portion into equal cells; below these, a confused conical diaphragm separates the lower and smaller half, which in its turn is divided into 4 or 5 irregular cells. Each cell is filled with a large number of grains crowded on thick spongy placentæ, which in the upper cells are parietal but in the lower appear to be central. The grains, which are about $\frac{1}{2}$ an inch in length, are oblong or obconical and many-sided, and consist of a thin transparent vesicle, containing an acid, saccharine, red juicy pulp surrounding an elongated angular seed."

The peel as imported is in irregular, more or less concave fragments, some of which have the toothed, tubular calyx still enclosing the stamens and style. It is $\frac{1}{20}$ to $\frac{1}{10}$ of an inch thick, easily breaking with a short corky fracture; externally it is rather rough, of a yellowish brown or reddish colour. Internally it is more or less brown or yellow, and honeycombed with depressions left by the seeds. It has hardly any odour, but has a strongly astringent taste. The bark occurs in rather thin quills or fragments, 3 to 4 inches long. Their outer surface is yellowish grey, sometimes marked with fine longitudinal striations or reticulated wrinkles, but more often furrowed by bands of cork, running together in the thickest pieces into broad flat conchoidal scales. The inner surface, which is smooth or marked with fine striæ, and is of a greyish yellow, has often strips of the tough whitish wood attached to it. The bark breaks short and granular; it has a purely astringent taste, but scarcely any odour.

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* Compare with Dioscorides i., 131, περὶ ρόας.

† Plin. 13, 19; Scribon. Comp. 85 and 112; Dios. i., 132; it is used to stop bleeding in accordance with the doctrine of signatures.

Microscopic structure.—The middle layer of the peel consists of large thin-walled and elongated, sometimes even branched cells, among which occur thick-walled cells and fibro-vascular bundles. Both the outer and the inner surface are made up of smaller, nearly cubic and densely-packed cells. Small starch granules occur sparingly throughout the issue, as well as crystals of oxalate of calcium. In a transverse section of the bark, the liber is seen to be the prevailing part of the cortical tissue. The former consists of alternating layers of two kinds of cells, one of them loaded with tufted crystals of oxalate of calcium, the other filled with starch granules and tannic matter. The bark is traversed by narrow medullary rays, and very large sclerenchymatous cells are scattered through the liber. Touched with a dilute solution of a persalt of iron, the bark assumes a dark blackish blue tint.

Chemical composition.—"The bark contains, according to Wackenroder (1824), more than 22 per cent. of tannic acid, which Rembold (1867) has ascertained to consist for the most part of a peculiar variety called Punico-tannic Acid, $C^{20} H^{16} O^{13}$; when boiled with dilute sulphuric acid, it is resolved into Ellagic Acid, $C^{14} H^{8} O^{9}$, and sugar. Punico-tannic acid is accompanied by common tannic acid, yielding by means of sulphuric acid, gallic acid, which appears sometimes to pre-exist in the bark. If a decoction of pomegranate bark is precipitated by acetate of lead, and the lead is separated from the filtered liquid, the latter on evaporation yields a considerable amount of mannite. This is probably the Punicin or Granatin of former observers." (Pharmacographia, 2nd Ed., p. 291.) Tanret (1878) announced the discovery of a liquid alkaloid which has the tænicide power of the bark. The alkaloid is obtained in a pure state by distilling its ethereal solution in a current of hydrogen, and maintaining the residue at a temperature of 130° to 140° C. until it no longer gives off the vapour of water. The temperature is then raised, and the liquid collected that distils between 180° and 185° C.

Pelletierine so obtained is colourless, but in the open air or in flasks incompletely filled it becomes coloured very rapidly. At zero its sp. gr. is 0·999 and at 21° C. 0·985. It is very soluble in water, with which it undergoes a contraction of volume, a mixture of 1 part of pelletierine with 2·5 parts of water having at 21° C. a sp. gr. of 1·021.

Pelletierine is dextrogyre, having in aqueous solution a rotatory power of $[a]j = + 80$, that of the sulphate prepared with the distilled alkaloid is $+ 5{\cdot}98$. With sulphuric acid and potassium bichromate pelletierine gives a green colour as intense as alcohol in the same conditions.

Analyses of the alkaloid as well as of the crystalline salts that it forms with sulphuric and hydrochloric acids indicate the formula $C^8 H^{13} NO$. It therefore furnishes another example of a volatile oxygenated base, near to conhydrine, $C^8 H^{17} NO$, and tropine, $C^8 H^{15} NO$.

Some experiments have been made in order to ascertain the amount of the alkaloid contained in bark from different parts of the plant and the influence of vegetation upon its formation. The bark used was all taken from ten-year old plants grown in Troyes, in the open air during the summer and in a green-house in winter. The results obtained therefore are considered to be comparable between themselves, although plants grown entirely in the open air under a warmer sky might yield different quantities of the alkaloid. The following figures show the yield in sulphate from 100 parts of bark:—

	Gathered June 10.	Gathered August 3.
Fibrillæ, entire, dry	......	1·30
Bark of fibrillæ, obtained by contusion, dry	0·66	2·25
Meditullium of fibrillæ, dry	......	0·63
Bark of roots larger than a pigeon's feather, fresh	0·60	0·92
Ditto, dry	1·20	1·54
Bark of large and medium-sized branches, fresh	0·34	0·37
Ditto dry	0·68	0·66
Bark of small branches, dry	0·32	......

Commerce.—Pomegranate root bark is seldom to be met with in the shops, as few gardens are without the plant; it is freshly dug when required. The rind is brought to Bombay from the Persian Gulf ports chiefly. Value, Re. 1⅛ per maund of 37½ lbs. The dried seeds are also imported.*

HAMAMELIDEÆ.

Liquidambar orientalis, *Miller, Bentl. and Trim.*, 107. Liquid storax.

Vernacular.—Siláras (*Hind.* and *Bomb.*), Neri-arishippál (*Tam.*), Miáh-sayelah (*Arab.*)

History, Uses, &c.—Liquid storax is prepared in the South Western Districts of Asia Minor by boiling the inner bark of the tree in water and pressing it; a superior kind is said to be obtained by simply pressing the bark before it is boiled. We learn from the author of the Periplus of the Erythrean Sea that as long ago as the first century storax was exported by the Red Sea to India. It was probably carried first to this country and afterwards to China by the Arab traders in the same manner as myrrh, olibanum and other odoriferous drugs. Upon the decline of the port of Surat the trade was transferred to Goa, and afterwards to Bombay, where it still continues, the imports averaging from 350 to 360 cwts. yearly. In the trade statistics of the early European traders it is called Rosa Mallas and Rosa Malloes, a name which it still retains, and the origin of which is doubtful, though some suppose it to be identical with Rasamála, the Malay name for Altingia excelsa. That the latter supposition is incorrect I think there can be little doubt, as the only Rose malloes known in Bombay is that imported from Europe. The following extracts will, I think, show that the name is of European origin, and has been applied to Liquid Storax incorrectly through a confusion of that substance with the Honey dew or Manna collected from trees, the δροσόμελι of the Greeks and the Ros melleus of the Middle Ages. Galen speaking of δροσόμελι says:—"I have sometimes known in summer a large quantity of honey to be found upon the leaves of trees, shrubs and certain herbs," &c. Ibn Sina says of Storax:—"One sort exudes from the tree and the other is obtained by boiling, the former is of a light colour and very valuable, the other dark and of less value." Serapion and Ibn Zakarieh (Rhazes) have the same account of it. According to Abu Hanífeh ضرو (Liquidambar orientalis) is of the trees of the mountains, and is like the great oak, having clusters (of berries) like those of the oak, but its berries are larger; its leaves are cooked, and when thoroughly cooked, are cleared away and the water thereof is returned to the fire, and coagulates, becoming like 'Kubaita' (a kind of sweetmeat), and is used medicinally as a remedy for roughness of the chest, and for pain of the fauces. Ibn Sina, Serapion and Zakarieh mention a manna which falls upon trees, and especially upon thorns, it is called *Turanjabín*, and has gentle purgative properties; it is expectorant, and softens the throat and chest. Ibn Baitar says:—"Rosmelleus is a substance which falls upon trees in Khorasan; it is useful in fevers, it moistens the chest, is detergent," &c. The author of the Tuhfat-el-Muminín says:—ضرو Darú or Zarú is the name of an Arabian tree like the oak; its fruit is like that of the بطم Butm (Pistacia terebinthus), but its seeds are larger, the gum of this tree is storax (Hassi luban), and has already been noticed. The wood, leavee and fruit are hot and dry, and a decoction of them with sugar, when brought to the consistence of a syrup by boiling, is used for roughness of the throat and cough. The oil of the seeds is odoriferous and dissolves phlegmatic humours; it is useful in dyspepsia, and in the scabby eruptions of animals (mange). The author of the Makhzan-el-Adwiya says:—"Rasímílíus is a Greek name for a kind of incense called in Arabic دخان الضرو and in Hindi अस्त लोबान (Western Frankincense)." In another place, speaking of ضرو, he says the Greek name is Fazukús (ζυγος) ? In Bombay it is always called Siláras, and is noticed in Sanskrit works as Silhaka, and described as a product of Turkey. The Hindus use it chiefly for perfuming medicinal oils, but are aware of its pectoral qualities, and occasionally prescribe it. In Arabic and Persian works Liquid Storax is called Meahsáyelah and Lubní, and is described as the gum or juice of a tree resembling the quince. Three kinds are generally mentioned—viz., 1*st*, that which exudes naturally; 2*nd*, that which is obtained by pressing the bark; and 3*rd*, that which is obtained by boiling it. These three kinds, however, are not at the present time distinguished in commerce in Bombay, though the article may vary in quality considerably. Storax is considered by the Mahometans to be tonic, resolvent, suppurative, and astringent; it is prescribed as a pectoral, and is thought to strengthen all the viscera; applied externally it is supposed to have a similar action upon the parts with which it comes in contact. It is a favourite application to swellings, and in Bombay is much used in orchitis, the inflamed part being smeared with it and then bound up tight in tobacco leaves. The Burmese Storax noticed in the Pharmacopœia of India is not known in Bombay. Much interesting information regarding the history and sources of Storax may be found in the Pharmacographia.

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* Tannate of Pelletierine is now used with success as a tænicide in doses of about 20 grains for an adult. The bowels are cleared out by a brisk saline cathartic the day before, the tannate is given in mucilage on an empty stomach, and about two hours afterwards a dose of castor oil. The drug produces cerebral congestion, giving rise to symptoms of dizziness, numbness, &c.

Description.—I have examined the liquid storax of the Bombay market, and find that it agrees with the description of the drug given by Flückiger and Hanbury, which is as follows:—"It is a soft viscid resin, usually of the consistence of honey, heavier than water, opaque and greyish brown. It always contains water, which by long standing rises to the surface. In one sample that had been kept more than 20 years, the resin at the bottom of the bottle formed a transparent layer of a pale golden brown. When liquid storax is heated, it becomes, by the loss of water, dark brown and transparent, the solid impurities settling to the bottom. Spread out in a very thin layer it partially dries, but does not wholly lose its stickiness. When free from water (which reddens litmus) it dissolves in alcohol, spirit of wine, chloroform, ether, glacial acetic acid, bisulphide of carbon, and most of the essential oils, but not in the most volatile part of petroleum (petroleum ether)." It has a pleasant balsamic smell, especially after it has been long kept; when recent, it is contaminated with an odour of bitumen or napthalin, that is far from agreeable. Its taste is sharply pungent, burning and aromatic.

"When the opaque resin is subjected to miscroscopic examination, small brownish granules are observed in a viscid, colourless, transparent liquid, besides which large drops of a mobile watery liquid may be distinguished. In polarized light, numerous minute crystalline fragments with a few larger tubular crystals are obvious. But when thin layers of the resin are left on the object-glass in a warm place, feathery or spicular crystals (styracin) shoot out on the edge of the clear liquid, while in the large, sharply-defined drops above mentioned, rectangular tables and short prisms (cinnamic acid) make their appearance. On applying more warmth after the water is evaporated, all the substances unite into a transparent, dark brown, thick liquid, which exhibits no crystalline structure on cooling, or only after a very long time. Among the fragments of the bark occurring in the crude resin, liber fibres are frequently observable.

Chemical composition.—The reader is referred to the Pharmacographia and other standard works on Materia Medica.

Commerce.—The imports of this article into Bombay in 1881-82 amounted to 363 cwts. from the Red Sea ports. Value, Rs. 16,154.

Under the name of Usturak (Storax), a bark is sometimes found in the Bombay drug shops; it is said to be imported from Turkey, and occurs in half quills several inches long, of a light brown colour, the external surface soft and corky, but the inner portion resinous and aromatic.

COMBRETACEÆ.

Terminalia chebula, *Retz.*, *Roxb. Cor. Pl.*, *t.* 197; *Bedd. Fl. Sylv.*, *t.* 27; *Gärtn. Fruct. ii.*, *t.* 97. The fruit.

Vernacular.—Har (*Hind.*), Hirda (*Bomb.*), Kaduk-kai (*Tam.*), Haritaki (*Beng.*)

History, Uses, &c.—Dutt (Hindu Materia Medica) informs us that Chebulic myrobalans, in Sanskrit Haritaki, Abhaya, and Pathyá were highly extolled by the ancient Hindus as a powerful alterative and tonic. They have received the names of Pranada or life-giver, Sudha or nectar, Bhishakpriya or Physician's favourite, and so forth.* A mythological origin has also been attributed to the tree. "It is said that when Indra was drinking nectar in heaven a drop of the fluid fell on the earth and produced the plant." Sanskrit writers describe seven varieties of Haritaki, which however are nothing more than the same fruit in different stages of maturity. Very large fruit are considered particularly valuable, and fetch a fancy price. Chebulic myrobalans are considered to be laxative, stomachic, tonic, and alterative. They are prescribed alone or in combination with Emblic and Belleric myrobalans in a vast number of diseases, chiefly those affecting the chest and abdomen. The three myrobalans together are called *triphala* in Sanskrit (the three fruits). Various original receipts for their administration will be found in Dutt's Hindu Materia Medica. Myrobalans were known to the early Arabian writers, and through them to the Greek writer Actuarius, who mentions five kinds. Nicolas Myrepsus also notices them. The author of the Makhzan-el-Adwiya, on the subject of Chebulic myrobalans, says that the very young fruit, about the size of cummin seeds, are called Halileh-i-Zira; when about the size of a grain of barley, Halileh-i-jawi; when of the size of a raisin, Halileh-i-Zangi or Halileh-i-Hindi; when half arrived at maturity and yellowish, Halileh-i-chini; when still further advanced, Halileh-i-asfar; and lastly, when quite mature, Halileh-i-Kabuli. Of these six varieties of Chebulic myrobalans the first, third, and last only are in general use, but the others are occasionally to be met with in the Bombay shops. The Mahometans, like the Hindus, attribute a great many fanciful properties to the drug; shortly, we may say, that the ripe fruit is chiefly used as a purgative, and is considered to remove bile, phlegm, and adust bile; it should be combined with aromatics, such as fennel seeds, caraways, &c. The unripe fruit (Halileh-i-Hindi) is most valued on account of its astringent and aperient properties, and is a useful medicine in dysentery and diarrhœa; it should also be given with aromatics. The first and second kind are supposed to have the same properties as the third in a less degree, and the 4th and 5th the same as the 6th in a less degree. The best way of administering myrobalans is to make them into a conserve with honey or sugar; two or three of the mature fruit are a sufficient purgative for an adult. Ainslie notices their use as an application to aphthæ. In the Pharmacopœia of India Dr. Waring mentions his having found six of the mature fruit an efficient and safe purgative, producing four or five copious stools, unattended by griping, nausea or other ill effects; probably those used by him were not of the largest kind.* Twining (Diseases of Bengal, Vol. I., p. 407,) speaks very favourably of the immature fruit as a tonic and aperient in enlargements of the abdominal viscera. I have found them a useful medicine in diarrhœa and dysentery, given in doses of a drachm twice a day. Roxburgh tells us that the tender leaves, while scarce unfolded, are said to be punctured by an insect, and its eggs deposited therein, which by the extravasation of the sap, become enlarged into hollow galls of various shapes and sizes, but rarely exceeding an inch in diameter. They are powerfully astringent, and make as good ink as oak galls. They also yield the chintz painters on the coast of Coromandel their best and most durable yellow. They are called by the Tamils *Kadu-cai,* and by the Telingas *Aldi-cai,* and are very like the *Faba Bengalensis* of our Materia Medica (Fl. Ind. II., 435.)

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* The following are the synonyms of Haritaki in the Nighant Básha:—Har, Civá, Pathyá, Chetakí, Vijayá, Jayá, Pramatthyá, Pramathá, Amoghá, Káyasthá, Pránadá, Amritá, Jivaniyá, Hemavati, Pútaná, Brantaná, Abhayá, Javasthá, Nandini, Creyasi, Rohini. In Sanskrit prescriptions any one of these names may be used.

Description.—The mature myrobalan is of an ovoid form, from 1—1½inches long, sometimes tapering towards the lower extremity, obscurely 5 or 6 sided, more or less furrowed longitidinally, covered with a smooth yellowish brown epidermis, within which is an astringent pulp, enclosing a large, rough, bony, one-celled endocarp.

The unripe fruits are shrivelled, black, ovoid, brittle bodies, from ⅓rd to ¾th of an inch in length, having a shining fracture and an extremely astringent taste; on careful examination the rudiments of the nut may be distinguished.

Chemical composition.—Myrobalans contain much tannin, but we have no information regarding the purgative principle. According to Stenhouse (1843), Chebulic myrobalans contain about 45 tannin, also gallic acid, mucilage and brown yellow colouring matter.† Herr Fridolin (1884) reported to the Dorpat Naturforscher Gesellschaft the isolation from Chebulic myrobalans of a new organic acid, which he has named

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* Dr. Hove in his account of a visit to the Myrobalan Plantation at Bungar in the Concan in 1787, states that he found one fruit a sufficient purgative, though the manager of the plantation told him that two were generally used.

† The *μυροβάλανον* of the Greeks, from which they extracted an oil used for unguents, is supposed to have been the Ben nut.

Chebulinic acid, and considers to be probably the source of the gallic and tannic acids detected by previous observers. He obtains it by saturating an aqueous solution of an alcoholic extract of the fruit with Sodium chloride, dissolving the matter that separates in water, and shaking the solution with acetic ether, which takes up the chebulinic acid together with tannic acid. The residue after the evaporation of the ether is dissolved in a little water and allowed to stand for a few days, when the chebulinic acid crystallizes out in rhombic prisons. The acid, which is odourless and sweet, dissolves very readily in alcohol and hot water, not so freely in ether, and with great difficulty in cold water, the solutions having an acid reaction. In aqueous solution the chebulinic acid reduces Fehling's solution, and in some of its reactions it closely resembles gallic acid. Herr Fridolin suggests as a formula probably representing its composition, $C_{28} H_{24} O_{19}$. When decomposed by heating an aqueous solution in a closed tube, chebulinic acid takes up the elements of water, and the molecule is split up into two molecules of gallic acid and one of tannic acid. Herr Fridolin suggests the possibility of the existence in other instances of an organic compound splitting up into tannic and gallic acids.

Commerce.—Chebulic myrobalans are exported to China for medicinal use and for dyeing. (See next article.)

Terminalia bellerica, *Roxb., Bedd. Fl. Sylv., t.* 19; *Wight Ic., t.* 91; *Rheede Hort. Mal. iv., t.* 10. The fruit.

Vernacular.—Bhairah, Baherá (*Hind.* and *Beng.*), Behaḍa, Heḷa (*Bomb.*), Tanrik-kay (*Tam.*)

History, Uses, &c.—Belleric myrobalans, in Sanskrit Vibhitaki, are considered by Hindu physicians to be astringent and laxative, and are prescribed in affections of the throat and chest. As a constituent of the *triphala* (three myrobalans), they are employed in a great number of diseases. The kernel of the fruit is narcotic if taken in large quantity, and is sometimes used as an external application to inflamed parts.

(Sarangadhara.) Formulæ for the administration of this myrobalan as a pectoral will be found in Dutt's Hindu Materia Medica. Mahometan writers describe it as astringent, tonic, attenuant, and aperient, useful in dyspepsia and bilious headache, also as an astringent application to the eyes. Belleric myrobalans are only briefly noticed by European writers upon Indian drugs. There is no doubt about the narcotic properties of the kernel. The part used in medicine is the pulp. The tree produces a quantity of gum.

In the Concan the kernel, with that of the marking nut, is sometimes eaten with betel nut and leaf in dyspepsia; the fruit also is used as an astringent usually in combination with Chebulic myrobalans.

Description.—The fresh drupe is obovate, the size of a nutmeg, somewhat pentagonal, fleshy, covered with a grey silky tomentum. When dry it is a little larger than a gall nut, of a dirty brown colour, and astringent taste; the stone is hard and encloses a sweet oily kernel.

The gum is in vermicular pieces, about the thickness of the finger, of the colour of inferior gum Arabic. Hardly at all soluble in water, in which it swells up and forms a bulky gelatinous mass; its taste is insipid. Roxburgh's statement that it is perfectly soluble in water, and Drury's, that it burns like a candle, I am unable to confirm.

Chemical composition.—Beyond the fact that they contain tannin, we know nothing of the composition of these myrobalans.

Commerce.—Both Chebulic and Belleric myrobalans are largely exported for tanning and dyeing. In 1881-82, Bombay exported 241,775 cwts. of both sorts, valued at Rs. 10,12,320. Of this quantity 237,746 cwts. went to the United Kingdom.

Terminalia catappa, *Linn., Lam. Ill., t.* 848; *Wight Ic.* 172; *Bot. Mag.* 3004; *Bedd. Fl. Sylv., t.* 18. The bark and kernel.

Vernacular.—Jangli-bádám (*Hind.* and *Bomb.*), Nattuvadamkottai (*Tam.*)

Description, Uses, &c.—This tree is commonly cultivated in Bombay on account of its handsome appearance. The natives eat the kernels, but they are not collected as an article of commerce, nor is the bark, which is astringent, made use of for any purpose. Drury informs us that the almonds yield upwards of 50 per cent. of pure bland oil, edible and pleasant tasted, but which if kept for any time deposits a large proportion of stearine. The oil is of a deep straw colour. The authors of the Pharmacopœia of India suggest the use of the oil as a substitute for almond oil, but in this part of India it could not be obtained in any quantity. The fruit is an oval, compressed, smooth drupe, with two elevated grooved margins, it is convex on both sides, and of a dull purple colour when quite ripe, the pulp being bright purple. In size it varies considerably according to the richness of the soil. Two inches may be about the average length in Bombay. The nut is rough, hard and thick, and the kernel about half the size of an almond, and of a similar shape; it is eaten in Bengal as a table fruit.

Terminalia tomentosa, *Bedd., Fl. Sylv., t.* 17. The bark.

Vernacular.—Ásan (*Hind.*), Ain (*Bomb.*), Kurruppu-marutamaram (*Tam.*), Piásál (*Beng.*)

Description, Uses, &c.—The bark of this tree is not often used medicinally in this part of the country. It is grey, deeply cracked, and astringent, and in the Pharmacopœia of India is favourably noticed as an astringent for both internal and external use upon the authority of Dr. A. Ross. The dose of the decoction (two ounces of the bruised bark, water a pint), is two ounces thrice daily. In Bombay Áin is one of the best and commonest kinds of firewood, and the timber is much valued on account of its toughness. When nicely polished it resembles walnut, and has been found one of the best woods for making stethescopes at the Government Medical Store Depôt.

Terminalia Arjuna, *Bedd., Fl. Sylv., t.* 28 ; *Mem. Combr., t.* 2. The bark.

Vernacular.—Kahu, Arjún (*Hind., Beng.* and *Bomb.*), Vellai-maruda-maram (*Tam.*)

Description, Uses, &c.—This tree requires notice on account of the bark, which is mentioned by Sanskrit writers under the names of Arjuna and Kukubha. They consider it to be tonic, astringent, and cooling, and prescribe it in heart disease, and for those purposes for which astringents are generally applied. According to Chakradatta it should be given with milk when used internally. The Hindu physicians appear to think that Arjún bark has some special virtue in promoting the union of fractures, and the dispersion of ecchymosis.

The bark is generally in short half quills, from $\frac{1}{8}$ to $\frac{2}{8}$ of an inch thick, and several inches long; it has a deep red colour, which is seen through the thin grey epidermis ; its substance is fibrous, but breaks with a short fracture ; the internal surface is finely striated. The taste is agreeably astringent.

The cells of the parenchyme contain much red colouring matter. The medullary rays are remarkable for the large size of the cells, which are full of fine granular matter. Numerous stony cells of great size and of a bright yellow colour, contrast remarkably with the reddish tinge of the other structures.

Terminalia paniculata, *Roth., Bedd. Fl. Sylv., t.* 20. *Vern.*—Kínjal (*Bomb.*), a handsome tree common in the Concan hills near the sources of rivers, having oblong, coriaceous leaves and terminal compound panicles of flowers, which appear in May. The fruit is small, 3-winged, one wing being much larger than the others. The country people use the juice of the fresh flowers rubbed with Parwel root (Cocculus villosus) as a remedy in cholera, and in poisoning with opium 4 tolás of the juice with an equal quantity of Guava bark juice is given frequently. In parotitis, the juice with Ghi and Saindhav (rock salt) is applied. In cholera about 4 tolás of the juice with an equal quantity of Parwel root is given every hour.

Anogeissus latifolia, *Wall.*, *Bedd. Fl. Sylv.*, *t.* 15; *Royle Ill.*, *t.* 45; *Wight Ic.*, *t.* 994.

Syn.—Conocarpus latifolia.

Vernacular.—Dháoyá (*Hind.* and *Beng*), Vallai-naga, Vackelie (*Tam.*), Dhaura, Dabria, (*Bomb.*) requires mention, as it yields a valuable gum. This generally occurs in vermicular pieces, very slightly coloured, translucent, tasting like gum Arabic, and readily soluble in cold water, with which it forms a strong almost colourless mucilage, having a faint peculiar odour. The tree is common in the Concan and Khandeish, and the gum is collected by the Bheels; it is worthy of attention for commercial purposes. The Sanskrit name of the tree is Dhava. The leaves are as rich in tannin as those of the Sumach (Lyon), but do not appear to have been exported.

Quisqualis Indica, *Linn.*, *Lam. Ill.*, *t.* 357; *Wight Ill.*, *t.* 92; *Bot. Reg. N. S. Vol. XXX.*, *t.* 15.

Vernacular.—Rangún-ki-bel (*Hind.*), Vilayati Chambeli (*Bomb.*), is not a native of the Bombay Presidency, but is commonly cultivated in gardens. I have never seen it in fruit. In the Pharmacopœia of India there is the following notice of it. The fruits are about an inch in length, oval or oblong, pointed at either extremity, and sharply pentagonal. The woody pericarp is thin, fragile and of a deep mahogany colour, and encloses an oily seed. In the Moluccas the seeds have long enjoyed repute as an anthelmintic, and in 1833 they were brought forward in this character by Dr. Oxley and Mr. Gordon of Singapore. (Calcutta Med. and Phys. Trans., Vol. VII., p. 488.) The testimony adduced in their favour by these authorities is strong, and is to the effect that in cases of lumbrici, four or five of these seeds, bruised and given in electuary with honey or jam, suffice for the expulsion of the entozoa in children. Bouton (Med. Plants of Mauritius, p. 58), who gives Liane vermifuge as the name of the shrub in the Mauritius, states "that if more than four or five of the seeds are given they are apt, in some constitutions, to cause spasms and other ill effects."

ONAGRACEÆ.

Jussiæa suffruticosa, *Linn., Lam. Ill., t.* 280, *f.* 3 ; *Rheede Hort. Mal. ii., t.* 50. *Vern.*—Pánalavanga.

The plant, reduced to a pulp and steeped in buttermilk, is considered useful in dysentery; a decoction is used as a vermifuge and purgative. (Ainslie.)

Description.—Tall, suffruticose, leaves from broadly lanceolate to linear acuminate, tapering into a short petiole; flowers axillary, almost sessile, yellow; calyx lobes broadly lanceolate or ovate, 4—5, much shorter than the rounded obovate petals. (*Bombay Flora.*)

MELASTOMACEÆ.

Memecylon edule, *Roxb., Cor. Pl. i., t.* 82 ; *Wight Ic., t.* 278.

Syn.—M. tinctorium.

Vernăcular.—Anjana, Yálki (*Bomb.*), Casha-maram (*Tam.*)

History, Uses, &c.—This shrub is best known as affording a yellow dye. (Conf. Drury No. 383.) It is wrongly supposed by Sprengel to be the Wars of the Arabians. The leaves have a reputation in India as a cooling astringent, and are used in conjunctivitis as a lotion, and given internally in leucorrhœa and gonorrhœa; they should be bruised in a mortar and infused in boiling water. Dr. Peters found them in use in Belgaum as a remedy for gonorrhœa of considerable reputation. In the Concan the bark with equal proportions of cocoanut kernel, ajwan seeds, yellow zedoary and black pepper, is powdered and tied up in a cloth for fomentation or applied as a *lép* to bruises.

Description.—The leaves (*Yálki-cha-pála*) in their fresh state are of a pale yellowish-green, which colour they retain when dried; they are firm and leathery, with short petioles and very indistinct lateral venation; average length in the Concan 2½ to 3 inches, breadth 1 to 1¼ inch; taste acid, astringent and bitter.

MYRTACEÆ.

Barringtonia acutangula, *Gärtn. Fruct. ii.* 97, *t.* 101; *Bedd. Fl. Sylv., t.* 204. The seeds.

Vernacular.—Hijjal (*Hind.* and *Beng.*), Samuudar-phal (*Bomb.*), Samutra-pullam (*Tam.*), Datte-phal, Sátphal (*Mar.*)

Description, Uses, &c.—The fruits of this tree and of the B. racemosa have exactly the same structure and similar medicinal properties. Roxburgh has the following description of them:—"Fruit drupaceous, of the size of a large pullet's egg, somewhat 4-sided,. pretty smooth on the outside, olive green within, the flesh rather spongy and brown, one-celled. Seed solitary, ovate-oblong. Integuments scarcely any other than the smooth, dark brown surface of the cell of the pericarpium. Perisperm conform to the seed, firm, fleshy and white. Embryo simple (as in the guttiferous seeds), lanceolate, length of the perisperm, inverse; when vegetation begins the plumula issues from the base of the fruit, and this part (the simple embryo) forms the ligneous centre of the shoots, while the perisperm furnishes the cortical part and the leaves. Radicle superior, (that is, from the apex of the perisperm and embryo, as the plumula is from the base) no appearance of any other cotyledon or cotyledons than the perisperm and embryo."

The dry seeds as met with in the shops resemble a nutmeg in size and shape; externally they are somewhat rough, brown, and marked with longitudinal striæ; internally horny, hard and brittle when dry, but easily softened by immersion in water; the bulk of the seed consists of starch. The granules are small and their natural form, which appears to be oval, is much modified by compression; they are contained in a delicate cellular parenchyme. Samundar-phal is very bitter, and is considered by the natives to be warm, stimulating, and emetic; in Bombay it is often prescribed alone or in combination with other medicines as an external application in colds. To reduce the enlarged abdomen of children it is given in small doses (2 to 3 grs.) in milk. A few grains are often given as an emetic to children suffering from catarrh, and seldom fail to induce vomiting. The Sanskrit name is Hijjala.

Commerce.—Value, Re. ½ per lb.

Careya arborea, *Roxb.*, *Cor. Pl. iii.*, 14, *t.* 218; *Wight Ill.*, 99, 100; *Bedd. Fl. Sylv.*, *t.* 205. *Vern.*—Kumbha (*Bomb.*), Puta-tanni-maram (*Tam.*), has a rough bark, the interior of which is red and very fibrous; it gives out much mucilage when moistened, and is used on this account for preparing emollient embrocations. The calices of the flowers are sold in the shops, under the name of Wakumbha; they are clove-shaped, 4-partite, fleshy, of a greenish brown colour, and about an inch long; when placed in water they become coated with mucilage and emit a sickly odour. The natives use them as well as the juice of the fresh bark with honey as a demulcent in coughs and colds. The tree yields a gum; it forms with water a tolerably thick mucilage of a dark brown colour.

Caryophyllus aromaticus, *Linn.*, *Bentl. and Trim, t.* 112. Cloves.

Vernacular.—Laung (*Hind.*), Lavang (*Bomb.*), Kirámbu, Ilavangap-pú, Karuváp-pu (*Tam.*)

History, Uses, &c.—The clove tree is said to be indigenous only in the five small islands, which constitute the Moluccas proper, *viz.*, Tarnati, Tidori, Mortir, Makiyan and Bachian. It was afterwards introduced into other neighbouring islands where it is now cultivated, and at a later period into Zanzibar and Pemba on the east coast of Africa. Cloves appear to have been known in China as early as B.C. 266 (*vide* Pharmacographia, p. 250). It is difficult to say when they were first introduced into India, but they are mentioned by Charaka, who is considered to be the oldest Sanskrit medical writer, under the name of Lavanga, a name which, with various modifications, is applied to cloves all over India. They are regarded by Sanskrit writers as light, cooling, stomachic, digestive and useful in thirst, vomiting, flatulence, colic, &c., and are prescribed with other spices and with rock salt. (*Vide* Dutt's Hindu Materia Medica.) For their early history in Europe the Pharmacographia may be consulted. The early Arabian writers call them Karanfal, a name probably derived from the Indian languages of the Malabar Coast, Ceylon, and the Straits*; this name appears in the writings of Paulus Ægineta and the later Greek physicians as καρυοφυλλον and καρυοφυλλα, undoubtedly meaning cloves. The καρυοφυλλον of Galen and Pliny (nut-leaf) was probably some other spice. Later Arabian and Persian authors of treatises on Materia Medica describe cloves as the fruit of a tree growing in Java or Batavia, a territory belonging to the Dutch Christians. In the Makhzan-el-Adwiya, a work written about one hundred years ago, it is distinctly stated that they are only produced in the Dutch possessions, and that they are of two kinds, male and female. The fruit of the clove is at the present time called Narlaung (male clove) in the Bombay market, a strange mistake but a common one among Asiatics, who argue that the seed-bearing organ or plant must be the male. Mahometan writers describe cloves as hot and dry, and consider them to be alexipharmic and cephalic, whether taken internally or applied externally; they also recommend them for strengthening the gums and perfuming the breath, and on account of their pectoral, cardiacal, tonic, and digestive qualities. They have a curious superstition to the effect that one male clove eaten daily will prevent conception. On the other hand, they tell us that the saliva after cloves have been chewed, if applied to the orifice of the male urethra before connection, increases the sexual orgasm in both parties.

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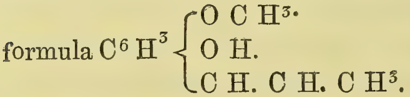
* Kirámbu, *Tamil*; Karámpu, *Malay*; Karámbu-nati, *Cingalese.*

Description.—The flowers of the cloves grow in cymes; when fit for gathering the calyx tube is of a bright red colour, and the tree presents a very beautiful appearance. The collection as witnessed by me at Zanzibar is by hand, each clove being picked singly. They are afterwards dried upon mats in the sun. The dried clove is about 2-3rds of an inch long, and consists of the calyx-tube, which divides above into four pointed spreading sepals, surmounted by a globular bud, consisting of 4 petals and enclosing a number of stamens. All parts of the clove abound in oil cells. If of good quality it should be plump, of a rich brown colour, and the oil should exude upon pressure being made with the finger nail; the taste should be aromatic and very pungent. For further particulars the standard works on Materia Medica may be consulted.

Chemical composition.—The following is extracted from the Pharmacographia:—"Few plants possess any organ so rich in essential oil as the drug under consideration. The oil known in pharmacy as Oleum Caryophylli, which is the most important constituent of cloves, is obtainable to the extent of 16 to 20 per cent. But to extract the whole, the distillation must be long continued, the water being returned to the same material.

"The oil is a colourless or yellowish liquid with a powerful odour and taste of cloves; sp. gr. 1·046 to 1·058. It is a mixture of a hydrocarbon and an oxygenated oil called *Eugenol*, in variable proportions. The former, which is termed *light oil of cloves*, and comes over in the first period of the distillation, has the composition $C^{15} H^{24}$, a specific gravity of 0·918, and boils at 251° C. It deviates the plane of polarization slightly to the left, and is not coloured on the addition of ferric chloride; it is of a rather terebinthinous odour.

"Eugenol, sometimes called Eugenic Acid, has a sp. gr. of 1·087 at 0° C., and possesses the full taste and smell of cloves. Its boiling point is 247°·5. With alkalies, especially ammonia and baryta, it yields crystallizable salts. Eugenol may therefore be prepared by submitting the crude oil of cloves to distillation with caustic soda; the 'light oil' distils then, the Eugenol, being now combined with sodium, remains in the still. It may be obtained on addition of an acid and again distilling. Eugenol is devoid of rotatory power, hence the crude oil of cloves, of which it is the prevailing constituent, is optically almost inactive. The constitution of Eugenol is given in the



$$\text{formula } C^6 H^3 \begin{cases} O\,C\,H^3. \\ O\,H. \\ C\,H.\,C\,H.\,C\,H^3. \end{cases}$$

It belongs to the phenol class, and has also been met with in the fruits of Pimenta officinalis, in Bay leaves, canella bark, cinnamon," &c. (*Op. cit.*, 2nd Ed., p. 284.)

Commerce.—The Bombay market is supplied with cloves from Zanzibar. In good seasons the imports are as much as 40,000 to 50,000 cwts., sometimes they fall as low as 20,000, a good year usually alternates with a bad one. In 1881-82 Bombay imported 1,895,913 lbs., valued at Rs. 9,75,014. Almost all the cloves imported are consumed in India, as a spice they are chewed with betel nut, and used for culinary and medicinal purposes. Value, Rs. 23 to Rs. 25 per Surat maund of 37½ lbs.

Clove stalks—Vikunia, *Vern.*, arrive here from Zanzibar; they are re-exported to Europe. There does not appear to be any demand for them in India. In 1881-82 the imports amounted to 187,040 lbs., valued at Rs. 29,862.

Mother cloves, called in India Narlaung (male cloves), are brought from Zanzibar, and are used for medicinal purposes in the East, as has already been mentioned. They are ovate-oblong berries about an inch long, and contain two dark brown oblong cotyledons which abound in starch. They have the same odour as cloves, but contain much less essential oil.

Value, Rs. 15 per maund of 37½ lbs. Imports in 1881-82, lbs. 3,139, valued at Rs. 2,106.

Oil of cloves.—No essential oil of cloves is manufactured in India. The oil of cloves of the bazars is made by steeping cloves in sweet oil.

Melaleuca leucadendron, *Linn., Bentl. and Trim., t.* 108. The essential oil.

Vernacular.—Kayaputi-ka-tel (*Hind.*), Kayakuti-tel (*Bomb.*)

History, Uses, &c.—This oil appears to have been first prepared as an article of commerce by the Dutch about 1727. Rumphius, who passed nearly fifty years in the Dutch East Indies and died at Amboyna in 1702, was the first to bring to notice that the Malays and Javanese made use of the leaves on account of their aromatic properties; this led to their distillation, and Rumphius relates how the oil was obtained in very small quantities, and was regarded as a powerful sudorific. It was probably unknown in India before the commencement of the present century, about the time when it first became an article of commerce in England. The island of Bouro in the Molucca Sea is stated by Bickmore, an American traveller, who passed some time there, to produce about 8,000 bottles annually; but from the trade returns of the Straits Settlements it appears that the largest quantity is shipped from Celebes. The oil is much used in India as an external application for rheumatism.

Description.—Cajuput oil varies in colour from yellowish green to bluish green; it is a transparent mobile fluid, with an agreeable camphoraceous odour, and bitter aromatic taste, sp. gr. 0·926, it remains liquid at 13° C., and deviates the ray of polarized light to the left.

Chemical composition.— The following summary is taken from the Pharmacographia:—"The researches of Schmidl (1860) and of Gladstone (1872) have shown that cajuput oil consists chiefly of *Hydrate of Cajuputene or Cajuputol,* $C^{10} H^{16} H^2 O$, which may be obtained from the crude oil by fractional distillation at 174° C. If it is repeatedly distilled from anhydrous phosphoric acid, Cajuputene, $C^{10} H^{16}$, passes over at 160 to 165° C.; it has an agreeable odour of hyacinths. After the Cajuputene, Isocajuputene distils at 177°, and Paracajuputene at 310° to 316°, both agreeing in composition with Cajuputene.

Like most essential oils having the formula $C^{10} H^{16}$, crude cajuput oil is capable of forming the crystallized compound, $C^{10} H^{16}, 3 OH^2$. This we have abundantly obtained by mixing four parts of the oil with one of alcohol 0·830 sp. gr., and one part of nitric acid 1·20 sp. gr.; the mixture should be allowed to stand in shallow dishes.

The green tint of the oil is due to copper, a minute proportion of which metal is usually present in all that is imported. It may be made evident by agitating the oil with very dilute hydrochloric acid. To the acid, after it has been put into a platinum capsule, a little zinc should be added, when the copper will be immediately deposited on the platinum. The liquid may be then poured off, and the copper dissolved and tested. When the oil is rectified, it is obtained colourless, but it readily becomes green if in contact for a short time with metallic copper. Guibourt has, however, proved by experiment, that the volatile oil obtained by the distillation of the leaves of several species of Melaleuca, Metrosideros and Eucalyptus, has naturally a fine green hue. It is not improbable that this hue is transient, and that the contamination with copper is intentional in order to obtain a permanent green.

Commerce.—The oil is imported into Bombay from Singapore in large quantities packed in common black bottles. From the official trade reports of the latter port it appears that India is the chief market for this article. Value, Rs. 1¾ per bottle.

Eugenia jambolana, *Lam., Wight Ic., t.* 535; *Bedd. Fl. Sylv. i., t.* 197. The fruit, and bark.

Vernacular.—Jámun (*Hind.*), Kálájám (*Beng.*), Jámbúl (*Bomb.*), Navel (*Tam.*), Jambúra (*Guz.*)

History, Uses, &c.—This tree, which yields an abundant crop of subacid edible fruit, during the months of July and August, is common all over the country. In some places the fruit attains the size of a pigeon's egg, and is of superior quality. Ibn Batuta, who visited India in 1332, mentions جمون as one of the fruits of Delhi. A vinegar prepared from the juice of the ripe fruit is an agreeable stomachic and carminative; it is also used as a diuretic. A sort of spirituous liquor, called Jámbáva, is described in recent Sanskrit works as prepared by distillation from the juice. The bark is astringent, and is used, alone or in combination with other medicines of its class, in the preparation of astringent decoctions, gargles and washes. The fresh juice of the bark is given with goat's milk in the diarrhœa of children. (Chakradatta.) The expressed juice of the leaves is used alone or in combination with other astringents in dysentery, as for example in the following prescription:—Take of the fresh juice of the leaves of E. Jambolana (Jambu, Sanskrit,) and the Mango, about a drachm each, Emblic myrobalans a drachm, and administer with goat's milk and honey. (Bhavaprakasa, in Dutt's Hindu Materia Medica.)

The author of the Makhzan notices the Jamún at considerable length; after describing the tree, he says that the fruit is a useful astringent in bilious diarrhœa, and makes a good gargle for sore throat or lotion for ringworm of the head. The root and seeds he observes are useful astringents, also the leaves. He tells us that a kind of wine is made from the fruit, and that the juice of the leaves dissolves iron filings, or, as he expresses it, reduces them to so light a condition that they float upon the surface of the liquid as a scum. This when collected and washed he recommends as a tonic and astringent. Recently the Jambul seed has been recommended as a remedy in diabetes and has been prescribed in the form of powder. The use of the drug is said to diminish the amount of urine secreted, and cause the disappearance of the sugar, these results being manifested in 48 hours after taking it. During the time that the patients are under the influence of the drug they are said to be able to take amylaceous food with impunity.

Description.—The fruit unless improved by cultivationis about the size and shape of an olive, of a purple colour, and very astringent; within it is a thin white papery shell, which encloses a large green kernel, also very astringent. The bark is grey and fissured externally; internally it is red and fibrous; its minute structure is remarkable in having several rows of very large, pitted, oblong-oval cells, which can be easily seen with the naked eye. The odour is like that of oak-bark, and the taste very astringent. No analysis of the fruit or bark appears to have been made.

Commerce.—The fruit and seeds are sold in the Indian markets.

Psidium Guyava, *Linn., Rheede Hort. Mal.* 3, *t.* 35; *Rumph. Amb. i., t.* 47. The bark,

Vernacular.—Lál-safri-ám and Sufed-safri-ám (*Hind.*), Lál-jám and Sufed-jám (*Duk.*), Támbara Perú and Pándhara Perú (*Bomb.*), Shivappu-goyyá-pazham and Vellai-goyya-pazham (*Tam.*)

History, Uses, &c.—The red and white guavás appear to be only varieties of one and the same species. They have been introduced into India from America, probably by the Portuguese, and are now universally cultivated, and in some parts of the country have run wild. The fruit is a favourite with the natives, who like its strong aromatic flavour. It is astringent and has a tendency to cause costiveness, especially if eaten without the rind. Europeans generally prefer it cooked, or in the form of jelly. In Goa the Portuguese make a kind of cake of it. The bark, which is also astringent, is recommended in the Pharmacopœia of India as a remedy for the chronic diarrhœa of children. Dr. Waitz (Dis. of Children in Hot

Climates, p. 225,) directs half an ounce of the root bark with six ounces of water to be boiled down to 3 ounces; of this decoction, the dose is one or more teaspoonfuls three or four times a day. He also recommends the same preparation as an external astringent in the prolapsus ani of children (p. 233). The leaves have also been used successfully as an astringent in diarrhœa.

Description.—The external surface of the bark when fresh is smooth and brown, marked by superficial scars indicating the separation of squamous plates of dead bark. These plates sometimes remain partially attached. Beneath the brown epidermis the bark is green; its inner surface is marked by longitudinal striæ, and is of a light brown colour. The taste is astringent and agreeably acid.

Microscopic structure.—Sections show that the bark consists of an epidermis, made up of two rows of brick-shaped brown cells, and alternate zones of vascular and parenchymatous tissue, varied towards the inner part by three broken circles of liber cells. The medullary rays are numerous, and together with the parenchyma of the outer part of the bark, loaded with green colouring matter; in the rays this extends some distance into its substance, and makes them very conspicuous. The vascular system is loaded with crystals.

Chemical composition.—The bark does not appear to have been examined.

Myrtus communis, *Linn.*, *Du. ar. e. n.*, *t.* 43. The berries are an article of the Mahometan Materia Medica, and are imported into Bombay under the Arabic name of Hab-el-Aas. They come by way of the Red Sea. The plant is generally grown in gardens in Bombay, and is called by the native gardeners Willayatí Mehndi (European Henna). It is too well known to require description. Mahometan writers attribute important medicinal properties to the Myrtle; these will be found fully discussed in the Makhzan-el-Adwiya.* As the plant is not a native of India, and its properties are well known in Europe, I do not think it necessary to enter into the subject here.

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* Compare with Dioscorides *περὶ μυρσίνης* i., 133.

CUCURBITACEÆ.

Citrullus colocynthis, *Schrad., Wight Ic., t.* 498; *Bentl. and Trim.*, 114. The fruit and root.

Vernacular.—Indráyan (*Hind.*), Indráyan (*Bomb.*), Peykomatti, Tumatti (*Tam.*), Kururundawan (*Mar.*)

History, Uses, &c.—Indian colocynth is common in Western India, and ripens in the cold season. The fresh fruit is brought for sale to Bombay by the herbalists; it is also collected in the neighbourhood of Poona for the preparation of the compound extract at the Government Botanical Gardens near that town.

Sanskrit writers describe the fruit as bitter, acrid, cathartic and useful in biliousness, constipation, fever and worms. They also mention the root as a useful cathartic in jaundice, ascites, enlargements of the abdominal viscera, urinary diseases, rheumatism, &c. Sarangadhara gives a receipt for a compound pill which contains Mercury 1 part, Colocynth pulp, Sulphur, Cardamoms, Long Pepper, Chebulic myrobalans, and Pellitory root of each 4 parts. The Sanskrit name of Colocynth is Indravároni. In the Concan the fruit and root, with or without nux vomica, is rubbed into a paste with water and applied to boils and pimples. In rheumatism equal parts of the root and long pepper are given in pill. A paste of the root is applied to the enlarged abdomen of children. (Compare with Scrib. Comp. 80.)

Mahometan writers call it Hanzal, and discuss its properties at great length. They consider it to be a very drastic purgative, removing phlegm from all parts of the system, and direct the fruit, leaves and root to be used. The drug is prescribed as with us, when the bowels are obstinately costive from disease or lesion of the nervous centres, also in dropsy, jaundice, colic, worms, elephantiasis, &c. Its irritant action upon the uterus is noticed, and fumigation with it is said to be of use for bringing on the menstrual flow.* The author of the Makhzan describes a curious method of administration. A small hole is made at one end of the fruit and pepper-corns are introduced, the hole is then closed, the fruit enveloped in a coating of clay and buried in the hot ashes near the fire-place for some days; the pepper is then removed and used as a carminative aperient. A similar preparation is made with rhubarb root instead of pepper. The same author tells us that the seeds are purgative, and mentions their use for preserving the hair from turning grey. Colocynth was familiar to the Greeks and Romans.†

Description.—The Indian fruit is nearly globular, of the size of an orange, smooth, marbled with green and yellow when fresh, yellowish-brown when dry, and contains a scanty greyish-white pulp in which a number of brown seeds are embedded This pulp in the fresh fruit is spongy and juicy, and occupies the whole of the interior of the fruit. Peeled colocynth is unknown in the Bombay market. The seeds are disposed in vertical rows on three thick parietal placentæ, which project to the centre of the fruit, then divide and turn back, forming two branches directed towards one another. The seeds are of flattened ovoid form, 3-10ths of an inch long, by 2-10ths broad, not bordered. The testa is hard and thick, with a finely granulated surface, and is marked on each side of its smaller end by two furrows directed towards the hilum. The leaves are glabrous and nearly smooth above, muricated beneath, with small, white, hair-bearing tubercles, many cleft and lobed, the lobes obtuse. The root is fibrous, tough and stringy, of a yellowish-white colour. All parts of the plant are very bitter, and the dust when dry very irritating to the eyes and nostrils.

Chemical composition.—Flückiger and Hanbury inform us in their Pharmacographia that the bitter principle was isolated by Hübschmann in 1847, by Lebourdais in 1848, and by Walz (1858), who treated alcholic extract of colocynth with water, and mixed the solution firstly with neutral acetate of lead, and subsequently with basic acetate of lead. From the filtered liquid the lead was separated by means of sulphuretted hydrogen, and then tannic acid added to it. The latter caused the colocynthin to be precipitated; the precipitate washed and dried was decomposed by oxide of lead, and finally the colocynthin was dissolved out by ether.

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* Compare Hippocrates de morb. mulier. ii., 50.

† *κολοκυνθίς*, Dios. iv., 171; colocynthis, Plin. 20, 3.

Walz thus obtained about ¼ per cent. of a yellowish mass or tufts, which he considered as possessing crystalline structure, and to which he gave the name Colocynthin. He assigns to it the formula $C^{56} H^{84} O^{23}$. Colocynthin is a violent purgative.

Colocynthin is decomposed, according to Walz, by boiling dilute hydrochloric acid, and then yields Colocynthein, $C^{44} H^{64} O^{13}$, and grape sugar.

The same chemist termed Colocynthitin that part of the alcoholic extract of colocynth which is soluble in ether but not in water. Purified with boiling alcohol, Colocynthitin forms a tasteless crystalline powder.

The pulp perfectly freed from seeds and dried at 100° C., affords 11 per cent. of ash; the seeds alone yield only 2·7 per cent. They have, even when crushed, but a faint bitter taste, and contain 17 per cent. of fat oil. (Pharmacographia, p. 264.)

Commerce.—In the months of December and January fresh Colocynth fruit is brought into Bombay from the neighbourhood for sale. The dried entire fruit is sold in the shops. Large parcels collected and dried up-country sometimes make their appearance in the drug market. Average value, Re. 1 per 100 fruits. The fruit supplied from Saharunpore, N.-W. P. in no way differs from that collected in the Deccan.

Cucumis trigonus, *Roxb.*, *Wight Ill.*, *t.* 105; *Wight Ic.*, *t.* 497, var. pubescens; *Royle Ill.*, *t.* 47; *Wight Ic.*, *t.* 496. (C. pseudocolocynthis, Royle,) *Vern.*—Kárit, is very common in the Bombay Presidency. The fruit is of the size and shape of a small egg, and marked with green and yellow streaks like colocynth.

It is very bitter, and at the feast of the Diwali, or new year of the Hindus, is brought to market for sale. The Hindus of Bombay have a custom at this season of breaking the fruit under the foot and then touching the tongue and forehead with it, with the idea that having tasted bitter of their own accord, they may hope to be preserved from misfortune during the year. It is not eaten, but is used medicinally in the same way that Citrullus amarus is used in Sind. C. trigonus, var. pubescens, *Vern.*—Takmaki, is much less bitter, and is commonly used as a vegetable after having been soaked in salt and water; the seeds of these cucumbers are considered cooling and are applied to Herpes, after they have been beaten into a paste with the juice of the *Durva* (Cynodon dactylon).

Momordica dioica, *Roxb.*, *Wight Ic.*, *tt.* 505, 506. The root.

Vernacular.—Karantolí (*Bomb.*), Palúpaghel-kalung (*Tam.*)

Description, Uses, &c.—This plant, the Sanskrit name of which is Vahisí, is very common in the neighbourhood of Bombay, making its appearance in the rainy season, and is remarkable for its ovate muricated fruits, which burst irregularly when ripe, showing the red arillus of the seeds, which are black, shining, and almost spherical. The plants are male and female, and have rather large yellow blossoms. The tubers of the female plant are the largest, and are used medicinally. The unripe fruit is eaten by the natives as a vegetable. Rheede says that the plant is truly cephalic, for mixed with cocoanut, pepper, red sandal, and other ingredients, and applied in the form of liniment, it stops all pains in the head. Ainslie notices the use of the root by Hindu doctors in the form of electuary in cases of bleeding piles, and in certain bowel affections connected with such complaints, the dose being about 2 drachms or more twice daily. In the Concan the juice of the root is a domestic remedy for the inflammation caused by contact with the urine of the House-lizard (Pál). The roots, which often weigh a pound or more, much resemble a turnip, but are more elongated; they are of a yellowish-white colour, and marked externally with whitish, raised circular rings; the taste is astringent. The sliced and dried roots have much the appearance of calumba.

Momordica charantia, *Linn., Bot. Mag., t.* 2455; *Wight Ic., t.* 504; *Bot. Reg., t.* 980. The fruit.

Vernacular.—Karela (*Hind.*), Kárlá (*Bomb.*), Pava-kai (*Tam.*)

Description, Uses, &c.—There are two chief varieties differing in the form of the fruit, the one being longer and more oblong, and the other smaller, more ovate, muricated and tubercled. There are besides many intermediate gradations. The fruit is bitter but wholesome, and is eaten by the natives. It requires, however, to be steeped in salt water before being cooked. That of the smaller variety is most esteemed. (Drury.) From Rheede, Wight and Gibson we learn that the Hindus use the whole plant combined with cinnamon, long pepper, rice and the oil of Hydnocarpus inebrians, as an external application in scabies and other cutaneous disease. The fruit and leaves are administered as an anthelmintic, and are applied externally in leprosy. In the Concan $\frac{1}{8}$ of a seer of the juice of the leaves is given in bilious affections, as an emetic and purgative, alone or combined with aromatics; the juice is rubbed in in burning of the soles of the feet, and with black pepper is rubbed round the orbit as a cure for night blindness. The Sanskrit name is Karavella, the muricated variety is called Sushavi. The author of the Makhzan-el-Adwiya describes the fruit as tonic and stomachic, and says that it is useful in rheumatism and gout, and in diseases of the spleen and liver; he also mentions its anthelmintic properties. He points out that some have erroneously supposed it to be identical with the Katha-el-himár of the Arabs, which is a violent purgative. Drury has the following description of M. charantia:—"Climbing, stem more or less hairy; leaves palmately 5-lobed, sinuate, toothed, when young more or less villous on the underside, particularly on the nerves; peduncles slender, with a reniform bracteole about the middle, female with it near the base; fruit oblong or ovate, more or less tubercled or muricated; seeds with a thick notched margin and red aril; flowers middle-sized, pale yellow." In the rainy season the plant may be seen in almost every garden in Bombay. The fruit is also offered for sale in the market, and when well cultivated attains the size of a cucumber.

Momordica Cymbalaria, *Fenzl.*

Syn.—Luffa tuberosa, *Roxb.*

Vernacular.—Kadavanchi (*Mar.*)

Description.—Root tuberous, ovoid; leaves 1—2 in. broad, 5-angular or slightly 5-lobed, middle lobe not elongated, glabrous or slightly pubescent, often punctulate on both surfaces, dentate; petiole $\frac{1}{2}$—1$\frac{1}{2}$ in. Male raceme 1—2 in., with usually only two to four flowers; calyx-lobes lanceolate; petals $\frac{1}{4}$ in., white; filaments two, one 2-fid, one 3-fid, so each with one anther-cell; filaments inserted near the top of the calyx-tube, anthers completely exsert. Female peduncle $\frac{3}{4}$—2 in., one-flowered, ebracteate (the male peduncle has a minute bract). Fruit $\frac{3}{4}$—1 by $\frac{1}{4}$ in. Seeds $\frac{1}{6}$—$\frac{1}{4}$ in., few, shortly obovoid, smooth, shining. (*Fl. of Brit. India.*) The fruit has eight prominent ribs, and is covered with silky hairs; while still green, it dehisces into four parts, and discharges its seeds, which are obovoid, dark brown, slightly warty, as large as a small peppercorn, and with a prominent hilum. The whole plant is acrid; it is mentioned here as a number of the tubers were forwarded to the Chemical Analyser to Government from Satara as having been found in the possession of a person suspected of administering drugs to procure abortion. My specimen was grown from one of these tubers which still retained vitality. Dr. Lyon, the Chemical Analyser, informs he that on reference to the records of his office he finds that the Kadavanchi tubers have been three times sent to him within the last four years as having been used to procure abortion.

Luffa acutangula, var. amara, *Roxb.*, *Bot. Mag.* 1638. The fruit and vine.

Vernacular.—Karvi-turai (*Hind.*), Kadú-sirola, Kadú-dorka (*Bomb.*), Ghoshá-latá (*Beng.*), Sendu-bir-kai (*Tel.*)

Description, Uses, &c.—This plant, in Sanskrit Koshátakì, is used medicinally by the Hindus, who apply the juice of the immature fruit which has been slightly roasted to the temples to cure headache, and administer the ripe seeds in infusion as a vomit and purge. Roxburgh notices the cathartic and emetic properties of the plant. In the Pharmacopœia of India it is described as a bitter tonic and diuretic, and is recommended in enlargements of the spleen on the authority of Dr. J. A. Green and Mr. J. C. Dickenson, but as the native names given are not those of Luffa amara, it is probable that some other cucurbitaceous plant was used by these gentlemen, possibly Momordica charantia. The vine of L. amara resembles that of the cultivated Turai (L. acutangula). The fruit is smooth, from 3 to 5 inches long, ovoid, marked with ten prominent, sharp longitudinal ridges; at the apex is a small operculum rather more than half an inch in diameter, which is deciduous. Internally it is filled with white spongy pulp, of a cucumber odour. The seeds are grey and marked with small irregular black prominent specks. The leaves are bitter, the fruit less so; the former in Bombay are used as an external application to sores in cattle. In dogbite the pulp of the fruit is given with water, it causes vomiting and purging. The juice is applied to different kinds of bites, and the dried fruit is used as a snuff in jaundice. The root with equal parts of Jasúnd root and Hemidesmus is given with milk, cummin and sugar in gonorrhœa.

Luffa echinata, *Roxb.* The vine and fruit.

Vernacular.—Kukar-wel (*Bomb.*); the seeds, Wa-upla-bij (*Guz.*), Deodágri (*Mar.*)

Description, Uses, &c.—I have not met with any notice of the medicinal use of this plant in European works on the Materia Medica of India. Roxburgh describes its botanical characters. In the Bombay Presidency it is found mostly in Guzerat, where it has a reputation among the Hindus on account of the bitter properties of the fruit, and is an ingredient in some of their compound decoctions. In the Concan a few grains of the bitter fibrous contents of the fruit are given in infusion for snakebite and in cholera after each stool; in putrid fevers the infusion is applied to the whole body, and in jaundice it is applied to the head and also given internally; the infusion has also a reputation as a remedy for colic. The dried vine with the ripe fruit attached is brought to Bombay for sale along with other herbs from the province of Guzerat. The stems are herbaceous, scandent, five-sided, slightly hairy; tendrils two cleft; leaves generally five-lobed, somewhat hairy, margins scallop-toothed; petioles as long as the leaves, ribbed; fruit oval, the size of a nutmeg, armed with numerous long, rather soft, diverging bristles, obscurely divided into three cells by numerous dry fibres, and opening at the top with a perforated stopple, which falls off when the seeds are ripe; seeds about 18, ovate, compressed, black and scabrous; testa very hard; kernel white. The fibrous substance in which the seeds are enclosed is intensely bitter.

Trichosanthes cucumerina, *Linn.*, *Rheede. Hort. Mal. viii.*, *t.* 15. The plant and fruit.

Vernacular.—Jangli-chichonda (*Hind.*), Rán Parul (*Bomb.*), Kattup-pepudal (*Tam.*)

History, Uses, &c.—This plant, called in Sanskrit Patola,* has a reputation among the Hindus as a febrifuge and laxative (Chakradatta); it is usually combined with aromatics. Ainslie remarks that both the leaves and fruit are bitter and aperient, and are reckoned amongst the stomachic and laxative medicines of the Tamools. Drury has the following account of its medicinal uses:—"The seeds are reputed good in disorders of the stomach on the Malabar Coast. The unripe fruit is very bitter, but is eaten by the natives in their curries. The tender shoots and dried capsules are bitter and aperient; they are given in infusion. In decoction with sugar they are given to assist digestion. The seeds are antifebrile and anthelmintic. The juice of the leaves expressed is emetic, and that of the root purgative. The stalk in decoction is expectorant." In Bombay the plant has a reputation as a febrifuge; it is given in decoction with ginger, chiretta and honey. Mahometan writers describe the plant as cardiacal, tonic, alterative and antifebrile, and say that it is a useful medicine for boils and intestinal worms. The author of the Makhzan remarks that the Hindus in obstinate cases of fever infuse 180 grains of the plant with an equal quantity of coriander for a night, and in the morning add honey to it and strain the liquor; this quantity makes two doses, one of which is taken in the morning and one at night. In the Concan the leaf juice is rubbed over the liver or even the whole body in remittent fevers.

Description.—Leaves broadly cordate, generally 7-lobed, serrated, fetid; tendrils 3-cleft; flowers like those of the cultivated snake gourd, but smaller; fruit 3 to 6 inches long, ovate, pointed at both ends, greenish-white, marked with broken longitudinal lines of a darker green; seeds large, from 20 to 30, surrounded by a thin, fetid, bitter, watery pulp. The plant is abundant in the neighbourhood of Bombay, and matures its fruit in September and October.

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* In Bengal Trichosanthes dioica is considered to be the Patola of Sanskrit writers; this plant is little known in Western India. I have been favoured with a specimen from Bengal by Surg. Major Peters, who tells me that it is universally cultivated there as a vegetable; it is less bitter than T. cucumerina and has smaller fruits. In Guzerat it is called Parwar, and is steamed, stuffed with spices, fried in ghi, and eaten with wheaten bread as a remedy for spermatorrhœa. T. cucumerina is, according to Ainslie, the Patola of Southern India. (Confer. Ainslie under T. laciniosa, Klein.)

Trichosanthes palmata, *Roxb., Wight Ill., tt.* 104, 105. The fruit and stem.

Vernacular.—Lál-indrayan (*Hind.*), Kaundal (*Bomb.*), Mákál (*Beng.*), Koratti, Shavari-pazham (*Tam.*)

History, Uses, &c.—This gourd, the Sanskrit name of which is Mahákála, is used by the Hindus of Western India as an ear ornament for their idol Gaṅpatti, who is dressed up and seated in state in every Hindu house once a year, to bring good luck to the inmates. The plant and fruit are considered medicinal. According to Ainslie, the fruit pounded and intimately blended with warm cocoanut oil is considered a valuable application for cleaning and healing offensive sores inside the ears, and is also used to cure ozæna. The root is said by Wight to be used as a cattle medicine, especially in inflammation of the lungs. In the Bengal Dispensatory it is stated that numerous trials were made with the fruit to ascertain whether it had purgative properties. Three grain doses thrice daily produced no sensible effect. Roxburgh informs us that the fruit is reckoned poisonous. In Bombay the natives sometimes smoke it as a remedy for asthma. The root with an equal portion of colocynth root is rubbed into a paste and applied to carbuncles, combined with equal portions of the three myrobalans and turmeric it affords an infusion which is flavoured with honey and given in gonorrhœa. T. palmata is supposed by some to be the Hanzal ahmar or red colocynth of Mahometan writers.

Description.—The fruit is round, oval, or pyriform, the size of a small apple, crimson when fresh, of a dull orange colour when dry, marked at one end by a deep cicatrix with sharp raised edges, at the other there is a prominence to which a portion of the stalk sometimes remains attached. In the dry fruit, which has a thin, brittle, very bitter shell, the segments of pulp with their seeds are loose, so that the contents of the gourd rattle. If a dry segment be soaked in water it soon softens, yielding a dark green pulp which smells like savine, and has an acrid and bitter taste. The seeds are flat, but very irregular in shape, generally somewhat triangular, and average 7-16th of an inch in length; they have a hard blackish shell, and sweet oily kernel. The vine is perennial, often as thick as a man's arm; it has a warty grey bark, marked by seven deep longitudinal fissures, which correspond to the medullary divisions between seven wedge-shaped woody and vascular bundles into which the stem is divided. The vine is not bitter.

Zehneria umbellata, *Thwaites, Rheede. Hort. Mal. viii. t.* 26.

Syn.—Bryonia umbellata.

Vernacular.—Amaut-múl, Tarali (*Hind.*), Kudari (*Beng.*), Gometta or Gometti (*Bomb.*), Tíd-dándá (*Tel.*)

History, Uses, &c.—This plant is the Momordica umbellata of Roxburgh, who notices the use of the fruit and roots by the natives, but does not give us any particulars. From the description in the *Flora of British India* it will be seen that this is a somewhat variable plant and extremely common throughout India, Ceylon, Malaya, China and North Australia. In the neighbourhood of Bombay it is abundant on hedges. Its medicinal properties do not appear to be generally known to European writers on Indian Materia Medica, nor does it appear to have had a place in the Sanskrit Materia Medica. In the Concan the juice of the root with cummin and sugar is given in cold milk as a remedy for spermatorrhœa, and the juice of the leaves is applied to parts which have become inflamed from the application of the marking-nut juice. As a *Paushtik*, or restorative and fattening medicine, roasted onions, Gometta root, cummin, sugar and ghi are given, or Gometta only with milk and sugar.

Description.—A variable plant (confer. *Flora of British India*), as found in Bombay it agrees with the description in the *Bombay Flora, viz.,* "Diœcious; root tuberous; leaves shortly petioled, cordate or sagittate or hastate at the base, the lobes longer than the petiole, 3 to 5-lobed, or palmately 5-partite, sinuate and sharply toothed; male flowers umbelled or shortly racemose, at the apex of a long slender peduncle; female on a different plant, solitary, short-peduncled; berry oval or oblong, size of a pigeon's egg, smooth, red when ripe." (*Bomb. Fl.,* under Bryonia umbellata.) The tuber is of an irregular, elongated form, usually about 1 inch in diameter; brown externally, white internally; it has a faint nauseous taste.

Benincasa cerifera, *Savi., Rheede Hort. Mal. viii., t.* 3. The fruit.

Vernacular.—Petha (*Hind.*), Kumra (*Beng.*), Kohala (*Bomb.*), Búrda-gúmúdú (*Tel.*)

History, Uses, &c.—Dutt in his Hindu Materia Medica gives us the following account of the medicinal use of this gourd by the Hindus:—The fruit is considered tonic, nutritive and diuretic, and a specific for hæmoptysis and other hæmorrhages from internal organs. It would appear that the old Sanskrit writers were not acquainted with its peculiar action on the circulatory system by which it rapidly puts a check to hæmorrhage from the lungs. The Raja Nirghantu, the oldest work on therapeutics, gives a long account of its virtues, but does not allude to its use in phthisis or hæmoptysis. Neither does Susruta mention it in his chapters on the treatment of hæmorrhage and phthisis, though the plant is alluded to by him elsewhere. The more recent compilations, such as Chakradatta, Sangraha, Sarangadhara, &c., give numerous preparations of the article, and detail its uses, *e.g.*, Khanda Kushmandaka or confection. In preparing this medicine, old ripe gourds are selected. Those not at least a year old are not approved. They are longitudinally divided into two halves, and the pulp scraped out in thin flakes by an iron comb or scraper. The watery juice that oozes out abundantly during this process is preserved, the seeds being rejected. The pulp is boiled in the juice until soft. It is then tied up tightly in a cloth, and the fluid portion allowed to drain away. The softened and drained pulp is dried in the sun, and the watery portion preserved for future use. Fifty tolás of the prepared pulp are fried in sixteen tolás of clarified butter, and again boiled in the juice of the fruit, till reduced to the consistence of honey. To this are added fifty tolás of refined sugar and the whole is heated over a gentle fire till the mass assumes such a consistence as to adhere to the ladle. The pot is now removed from the fire, and the following substances, namely, long pepper and ginger, each two tolás, cummin seeds, cardamoms, cinnamon, folia malabathri, black pepper and coriander, each half a tolá in fine powder, are added to the syrup and stirred briskly with a ladle, till the mass is cool. Eight tolás of honey are now added to the confection, which is preserved in a new earthen pot. The dose is from one to two tolás, according to the age and strength of the patient. It is prescribed in hæmoptysis, phthisis, marasmus, cough, asthma, &c., &c.

In the Concan this preparation is made by steaming the rind and pulp cut fine, when well softened it is tied up in a cloth and allowed to drain, saffron, nutmeg, cardamoms and melted sugar are then added.

In insanity, epilepsy and other nervous diseases the fresh juice of the fruit is given either with sugar or as an adjunct to other medicines. According to Dr. Savinge of Rajamundry it has been used with success in diabetes, 4 ozs. of the juice with 100 grs. each of saffron and the bran of red rice, are given morning and evening and a strict diet enjoined.

The fruit of B. cerifera is sub-rotund, 12 to 15 inches in diameter, hairy when young, smooth with a whitish bloom when ripe. It is a common vegetable, and is cultivated in Bombay and the Deccan.

Ampelosicyos scandens, *Thou., Bot. Mag.* 2681, 2751-2. The seeds have been introduced into Bombay from Zanzibar as a vermifuge; they are flat and almost circular, about an inch and a half across; the external envelope resembles delicate basket work, and is very tough and strong; the kernel yields a quantity of bland oil. The entire fruit is from 2 to 3 feet in length and 8 to 10 inches thick, marked with deep longitudinal furrows, the inside is divided into from three to six cells, and often contains as many as 250 seeds.

Lagenaria vulgaris, *Seringe, Wight Ill., t.* 105; *Lam. Ill., t.* 795; *Rheede Hort. Mal. viii., t.* 5. (Var. amara.) The fruit.

Vernacular.—Tumbi, Karwí-tumbi (*Hind.*), Tikta-lau (*Beng.*), Karwa-bopla (*Bomb.*), Shora-kai (*Tam.*)

Description, Uses, &c.—The bottle gourd, of which there are two varieties, a sweet or cultivated one, called in Sanskrit Alábu, and a bitter wild one, known as Katutumbi, is very common in India. The wild fruit grows to a very great size and varies much in shape; those which are bottle-shaped serve a variety of useful purposes, being made into guitars, bottles, floats for crossing rivers, &c. The outer rind is hard and ligneous, and encloses a spongy white flesh, very bitter, and powerfully emetic and purgative. The seeds are grey, flat and elliptical, surrounded by a border which is inflated at the sides but notched at the apex; their kernels are white, oily and sweet. In Bombay the pulp in combination with other drugs is used in native practice as a purgative; it is also applied externally as a poultice. The seeds were originally one of the four cold cucurbitaceous seeds of the ancients, but pumpkin seeds are now usually substituted for them.

The Hindus administer a decoction of the leaves in jaundice; it has a purgative action.

The dried gourds are imported into Bombay from Zanzibar for making the native guitars (Tambúra); they are considered much superior to the Indian.

Citrullus vulgaris, *Schrad., Stocks in Hook. Kew Journ. Bot. iii., t.* 3. The seeds.

Vernacular.—Tarbuz (*Hind.*), Tarmuj (*Beng.*), Tarbuj, Kálingad (*Bomb.*), Pitcha-pullum (*Tam.*)

History, Uses, &c.—The seeds of the Water melon are of interest as being one of the four cold cucurbitaceous seeds of the ancients, which, according to Guibourt, were originally—Cucumis sativus, *L.*, Cucumis citrullus, *D. C.*, Cucumis melo, *L.*, Lagenaria vulg. clavata, *D. C.*, but he remarks that in Paris the seeds of Cucurbita pepo, Duch., and Cucurbita maxima (the *potiron* of the French) are now substituted for those of Cucumis citrullus and Lagenaria vulgaris. In Bombay the four cold cucurbitaceous seeds sold in the bazars are those of Cucumis utilissimus, Benincasa cerifera, Cucumis melo, and Citrullus vulgaris. These seeds are in great demand, and are kept decorticated and ready for use. The natives always use them together, and consider them to be cooling, diuretic and strengthening. They fetch Re. $\frac{3}{4}$ per pound. The juice of the Water melon is used with cummin and sugar as a cooling drink.

Citrullus vulgaris, *Schrad.* Var. amarus.

The fruit of this variety, sold in the bazars of Sind in a dried state, under the name of "Kirbut," is used as an emetic, and in small doses with honey as a stomachic for children. It is extremely bitter. (Murray.)

Cephalandra indica, *Naud., Wight Ill., t.* 105; *Hook. Ic. Pl.* 1, *t.* 138. *Syn.*—Coccinia indica. *Vern.*—Vimba (*Sans.*), Rántondla (*Bomb.*), Telákucha (*Beng.*), Kanduri (*Hind.*), Kovai (*Tam.*), is mentioned by Dutt as being used medicinally by the Kavirajas of Calcutta, and by Moidín Sheriff as being used medicinally in Southern India. Dutt informs us (Hindu Mat. Med., p. 171) that the expressed juice of the thick tap root is used as an adjunct to the metallic preparations prescribed by the Kavirajas in diabetes. The dose of the juice is one tolá (180 grs.) along with the mercurial pill every morning. In the Concan the root pounded with the juice of the leaves is applied as a *lép* to the whole body to induce perspiration in fever. Moidín Sheriff states that in the bazars of Southern India the root is sold as a substitute for Kabar (Capparis spinosa root). In Bombay true Kabar imported from Persia is always obtainable.

The fruit of C. Indica when cultivated loses its bitterness and is one of the commonest native vegetables, and the leaves, which are of a deep green colour, I have found useful as a colouring agent in preparing Savine ointment from the essential oil. In the Concan the green fruit is chewed to cure sores on the tongue.

Description.—Fruit bitter, fleshy, cylindrical, smooth, green, with ten white stripes when unripe, in which state it is used; when ripe scarlet, indehiscent, about 2 inches long by one in diameter; seeds numerous. The root is an oblong tuber, and attains a considerable size in very old plants; it is brown externally and marked by numerous warts arranged in circular lines; the interior of the tuber is of a yellowish white, divided into a central and cortical portion, in the latter the medullary rays are conspicuous. When cut the root exudes a somewhat sticky juice which hardens into a reddish gum on drying, and is very astringent but not bitter like the fruit. The odour of the fresh root exactly resembles that of the cucumber.

Ecballium elaterium, *A. Richard, Bentl. and Trim., t.* 115. Under the name of Káteri-indráyan, the fruit of this plant, or of a closely allied species, is sold in the Bombay shops. It is imported from Persia, and has evidently been gathered while immature, as the contents of the cucumber have not been discharged. Elaterium does not appear to be known in Hindu medicine, but the Arabs and Persians are well acquainted with it. The former call the fruit Katha-ul-himár and the latter Khiyár-i-khar (Asses' cucumber). The author of the Makhzan-el-Adwiya describes it, and also the method of preparing Elaterium. To prepare this he directs the fruit to be sliced, thrown upon a strainer and pressed, the pulp is then to be twice washed with water, and the deposit, which is thrown down from the water, collected and dried. It is then to be finely powdered and made into lozenges, with an equal weight of gum Arabic or Calamine, or half its weight of starch.* The Mahometan writers attach considerable importance to Elaterium as a purgative of the diseased humours, which they suppose to be the cause of a great number of diseases. They also use poultices made with the fruit, leaves and root of the plant, and direct the juice of the fruit to be snuffed up the nose to purge the brain and to be dropped into the ears in otitis. It is worthy of remark that the Hindus use their bitter and purgative cucurbitaceous fruits in the same manner. For an account of the chemistry of Elaterium, which still requires further examination, I must refer the reader to Gmelin's Chemistry and other standard works. The active principle, Elaterin, $C^{20} H^{28} O^{5}$, is best obtained by exhausting Elaterium with Chloroform. From this solution a white crystalline deposit of Elaterin is immediately separated by addition of ether. It should be washed with a little ether and recrystallized from Chloroform.

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* Compare with Dioscorides *περί ελατηρίου,* iv., 149.

Corallocarpus epigœa, *Hook. f., Wight Ic., t.* 503. The root.

Syn.—Bryonia epigœa.

Vernacular.—Rákas-gaddah, Akás-gaddah (*Hind.*), Karwinai (*Bomb.*), Akásha-garudan (*Tam.*)

Description, Uses, &c.—The root is of varying thickness and length, and much resembles that of Momordica dioica, being in shape not unlike a badly-grown turnip, but much larger; externally it is yellowish white and marked with raised circular rings, the taste is bitter, mucilaginous and subacid. When cut, it exudes a viscid juice, which soon hardens into an opalascent gum. Ainslie remarks that the Vytians hold it in great estimation, and prescribe it in the latter stages of dysentery, and old venereal complaints. It is usually administered in powder, the dose being about one drachm in the 24 hours, and continued for eight or ten days together; this quantity generally produces one or two loose motions. It is also considered anthelmintic. For external use in chronic rheumatism it is made into a liniment with cummin seed, onions and castor oil. In the Deccan and in Mysore the root has a repute as a remedy for snake-bite; it is administered internally, and applied to the bitten part. M. Jules Lepine, of Pondicherry, has detected in it a bitter yellow uncrystallizable substance, which may possibly prove to be identical with Bryonin, the bitter principle of B. dioica.* The Lúf or Lúfa of Arabic and Persian works is probably a Bryony, but there is nothing to enable us to identify it with this species.

Bryonin, the bitter principle of B. dioica, may be obtained by treating the root with boiling water, precipitating the filtered liquid with subacetate of lead, decomposing the precipitate with sulphuretted hydrogen, evaporating the filtered liquid, and exhausting the residue with alcohol. It is a yellowish-white mass, sometimes red or brownish; tastes sweetish at first, then styptic and very bitter; soluble in water and alcohol, insoluble in ether. Sulphuric acid dissolves it, forming a blue liquid, which changes to green. It is not altered by alkalies. Bryonin acts as a drastic purgative, and in large doses is poisonous. (Brande's Arch. Pharm. III., 356; Gerh. Traité, IV., 274.)

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* The *ἄμπελος λευκη* of Dioscorides, the Arabic Lúfa, is probably a corruption of *λευκη*. Several cucurbitaceous plants are mentioned by Greek Medical writers, *ἄμπελος μέλαινα* is supposed to be Bryonia alba.

According to Walz (Chem. Centralb., 1859, p. 5,) the alcoholic extract of Bryony root contains two bitter substances, Bryonin and Bryonitin, which may be separated by treating the aqueous infusion of the alcoholic extract with subacetate of lead, which precipitates the greater part of the Bryonitin, leaving Bryonin in solution. Bryonin when freed from adhering resin by treatment with absolute ether, is a white or slightly coloured granular substance, transparent in thin layers, and according to Walz, contains $C^{48} H^{80} O^{19}$; but the simpler formula, $C^{5} H^{8} O^{2}$, agrees well enough with the results of the analysis. It appears to be a glucoside, and is resolved by boiling with dilute sulphuric acid, into glucose and two amorphous bodies, *viz.*, Bryoretin soluble in ether, and Hydrobryoretin, insoluble in ether, but soluble in alcohol.

$$\underset{\text{Bryonin.}}{C^{48} H^{84} O^{21}} = \underset{\text{Bryoretin.}}{C^{21} H^{35} O^{7}} + \underset{\text{Hydrobryoretin.}}{C^{21} H^{37} O^{8}} + \underset{\text{Glucose.}}{C^{6} H^{12} O^{6}}$$

Bryonitin forms a white crystalline mass soluble in water and ether, insoluble in alcohol. Walz regards the Bryonin of Brandes and Firnhaber as an impure substance. (Watt's Dictionary of Chemistry, Vol. I., p. 684.)

Commerce.—The living tubers are always obtainable in the Bombay bazar under the name of Karwi-nai; they are sometimes as much as five or six pounds in weight.

Bryonia laciniosa, *Linn., Wight Ic., t.* 500. *Vern.*—Gargúnarú (*Hind.*), Kawale-che-dole (*Bomb.*), is a climbing plant with a smooth stem. The leaves are palmately 5-lobed, more or less deeply divided, segments oblong, lanceolate acuminated, serrated; petioles muricated, upper surface of the leaf thickly studded with white jointed calcareous hairs, rising from a calcarcous areola; male and female flowers on the same axils, the peduncles of the male flowers, which are numerous, remaining until the fruit ripens; fruit round, smooth, red with white streaks, the size of a marble. The whole plant is collected when in fruit for medicinal use. It is bitter and aperient, and is considered to have tonic properties.

Rhynchocarpa fœtida, *Schrad.* *Syn.*—Bryonia rostrata, Appakovay (*Tam.*) is common in Guzerat. Ainslie says that the root is prescribed internally in electuary, in cases of piles, and in powder is sometimes ordered as a demulcent in humoral asthma. The root is about the size of a finger, and light grey; taste sweetish and mucilaginous. I have not seen it used.

DATISCEÆ.

Datisca cannabina, *Linn.*, *Lam. Ill.*, *t.* 823; *Sibth. Fl. Græc.*, *t.* 960. The herb and roots.

Vernacular.—Akalbar (*Hind.*), Bayr-bunja, Bhangjala (*Punj.*)

Uses.—Datisca is bitter and purgative, and is occasionally used in fevers and in gastric and scrofulous complaints. In Khagan the bruised root is applied to the head as a sedative, and Madden states that under the name of *Bujr Bunga* it is used medicinally in Kurnool. (Stewart, Cleghorn.) The plant is a native of Sind, and may be administered in doses of from 5 to 15 grains in intermittents.

Description.—Stem 2—6 ft., stout, branching. Lower leaves 1 ft., pinnate; leaflets 7—11, 6 by 1½ in., petioled; upper much smaller and less divided; floral simple, 3 by 1¼ in. Pedicels often carrying linear bracts; anthers oblong, rather large; filaments very short; styles ¼ inch; capsule ⅓ by less than ⅓ inch (Fl. Br. Ind.), one-celled, opening at the apex; seeds numerous, striated, with a cup-like covering at the base.

Chemical composition.—The leaves and roots contain a glucoside, $C^{21} H^{22} O^{12}$, which may be obtained by exhausting them with alcohol, evaporating to a syrup, and precipitating the resin with water; from the decanted liquid crystals may be obtained which should be redissolved in alcohol and the remaining traces of resin removed by reprecipitation with water. Datiscine may then be obtained in colourless silky needles or scales, little soluble in cold water and only sparingly so in warm water and ether. The crystals are neutral and have a bitter taste; they melt at 180° C. (Braconnot, Ann. de Chim. et de Phys., t. iii., 277; Stenhouse Ann. der Chem. u. Pharm., t. xcviii., 166) quoted in Wurtz, Dict. de Chim., t. i., 1134.

PASSIFLOREÆ.

Carica papaya, *Linn., Bot. Reg.* 459. The fruit and milky juice.

Vernacular.—Papiya (*Hind.*), Papai (*Bomb.*), Pappali-maram (*Tam.*)

Description, Uses, &c.—The following account of the Papaw is taken from the Pharmacopœia of India:—"This tree is a native of the Western hemisphere, but is now domesticated in India and other tropical countries; it is from 20 to 30 feet high, without branches;* leaves alternate, palmate, 7-partite; segments oblong, acute, sinuated, the middle one 3-fid, corolla tubular in the male and 5-lobed in the female, divided nearly to the base into five segments; male flowers axillary in slightly compound racemes or panicles, white; female generally on a different tree, in the axils of the leaves, large and fleshy, yellowish; fruit succulent, oblong, furrowed; the size of a small melon, yellowish green when ripe, and containing a number of round grey slimy seeds, which smell like cress. In the unripe state the fruit abounds in a thick milky juice. The anthelmintic properties of the milky juice were first noticed in the 17th century by Hernandez; and the attention of the profession in India was called to it in 1810 by Dr. Fleming (Asiatic Researches, Vol. XI.), who cites an interesting passage from the writings of M. Charpentier Cossigni in support of its alleged virtues. Further confirmatory evidence has more recently been adduced by M. Bouton (Med. Plants of Mauritius, 1857, p. 65), and it may justly be concluded that the statements as to its efficacy as an anthelmintic are founded on fact. The following mode of administration employed by the late Dr. Lemarchand, of the Mauritius (cited by Bouton), it would be desirable to adopt in all future trials with this remedy. Take of fresh Papaw milk, honey, of each a tablespoonful; mix thoroughly, gradually add three or four tablespoonfuls of boiling water; and when sufficiently cool take the whole at a draught, following its administration two hours subsequently by a dose of castor oil, to which a portion of limejuice or vinegar may be added. This may be repeated two days successively if required. The above is a dose for an adult; half the quantity may be given to children between 7 and 10 years of age; and a third or a teaspoonful to children under 3 years. If it cause griping, as it occasionally does, enemas containing sugar have been found effectual in relieving it. Taking the dose above named as correct, the statement of Sir W. O'Shaughnessy (Bengal Disp., p. 352), that he had administered the milky juice as an anthelmintic, in doses of from 20 to 60 drops, without obvious effect, is fully explained. It is principally effectual in the expulsion of lumbrici. On tænia it is reported to have little effect. Anthelmintic virtues have also been assigned to the seeds, but the evidence of their efficacy is very inconclusive. A belief in their emmenagogue properties prevails amongst all classes of women in Southern and Western India; so much so, that they assert that if a pregnant woman partake of them, even in moderate quantities, abortion will be the probable result; the same prejudice exists against eating the fruit. Facts in support of the alleged emmenagogue properties of the Papaw are still wanting." (Phar. of India, p. 97.

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* The tree not unfrequently throws out numerous branches. When male and female flowers occur on the same tree the female flowers are borne upon long racemes along with the male flowers.

The author of the Makhzan accurately describes the tree, and mentions the use of the juice mixed with that of fresh ginger for making meat tender; medicinally he says it is a remedy for hæmoptysis, bleeding piles and ulcers of the urinary passages; it is also useful in dyspepsia; rubbing the milk in two or three times cures ringworm, or psoriasis (قوّبا), causing a copious serous exudation attended with itching. (*Op. cit.*, article Papiya.) Evers has employed the milk in the treatment of splenic and hepatic enlargements with good results; a teaspoonful with an equal quantity of sugar divided into three doses was administered daily. (*Ind. Med. Gazette*, Feb. 1875.)

Chemical composition.—Herr Wittmack has recently (1878) examined the properties of the milky juice with the following results:—He obtained after repeated incision of a half ripe fruit, 1·195 grammes of white milky juice of the consistence of cream. This dried in a watch glass to a hard vitreous white mass, having what appeared to be greasy spots on the surface, but what really were flocks of a gelatinous substance that always adheres to the more hardened material. The odour and flavour of the fresh juice recalled that of petroleum or of vulcanised India-rubber. The microscope showed it to be a fine grumous mass containing some larger particles and isolated starch grains. Iodine coloured the juice yellowish-brown. A portion of the juice was dissolved in three times its weight of water, and this was placed with 10 grammes of quite fresh lean beef in one piece in distilled water, and boiled for five minutes. Below the boiling point the meat fell into several pieces, and at the close of the experiment it had separated into coarse shreds. In the control experiments made without the juice the boiled meat was visibly harder. Hard boiled albumen, digested with a little juice at a temperature of 20° C., could after twenty-four hours be easily broken up with a glass rod. 50 grammes of beef in one piece, enveloped in a leaf of C. papaya during 24 hours at 15° C., after a short boiling became perfectly tender; a similar piece wrapped in paper and heated in the same manner remained quite hard. Some comparative experiments were also made with pepsin, and the following are the conclusions arrived at by the author:—

(1) The milky juice of the Carica papaya is (or contains) a ferment which has an extraordinarily energetic action upon nitrogenous substances, and like pepsin curdles milk; (2) this juice differs from pepsin in being active without the addition of free acid, probably it contains a small quantity, and further it operates at a higher temperature (about 60° to 65° C.) and in a shorter time (5 minutes at most); (3) the filtered juice differs chemically from pepsin in that it gives no precipitate on boiling, and further that it is precipitated by mercuric chloride, iodine, and all the mineral acids; (4) it resembles pepsin in being precipitated by neutral acetate of lead, and not giving a precipitate with sulphate of copper and perchloride of iron. (Pharm. Jour. (III.), Nov. 30, 1878.) The active principle has since been separated and given the name of Papaine; it is now an article of commerce in Europe for medicinal purposes, and is said to be capable of digesting 200 times its weight of fibrine; it has been used as a solvent of diphtheritic false membrane, and also as a local application in old standing cases of chronic eczema, more especially of the palms of the hands, and where other remedies failed great benefit has attended its application in the following way:—12 grains of Papaine, and 5 grains of powdered borax, in 2 drachms of distilled water, to be painted on the parts twice daily.

CRASSULACEÆ.

Bryophyllum calycinum, *Salisb., Bot. Mag., t.* 1409; *Wight in Hook. Bot. Misc. iii.,* 100. The leaves.

Syn.—Kalanchoe pinnata.

Vernacular.—Ghaimári, aranmaran (*Bomb.*)

Description, Uses, &c.—This plant is a native of the Deccan and Concan, and is also cultivated in gardens. Roxburgh describes it as a native of the Moluccas. In this part of India it has a great reputation as a vulnerary. The leaves slightly toasted are used by the natives as an application to wounds, bruises, boils, and the bites of venomous insects, much as those of the House leek are with us. I have seen decidedly beneficial effects follow their application to contused wounds; swelling and discolouration were prevented, and union of the cut parts took place much more rapidly than it does with the ordinary treatment by water dressing. B. calycinum is a tall, fleshy, erect, suffruticose plant, having thick, ovate-crenated leaves, consisting of one large leaflet and two smaller ones; petiole and margin of leaf purple ; blossom a terminal panicle of pendulous, tubular, yellowish-red flowers; the leaves have a strongly acid and astringent taste. I have not met with any notice of their medicinal use in Indian works on Materia Medica. The Mahometans of India call this plant, as well as K. laciniata, " Zakhmhyát." In the Concan the juice of the leaves is administered in ¼ to 1 tolá doses, with double the quantity of ghi, in dysentery.

Kalanchoe laciniata, *D. C., Pl. Grasses, t.* 100; *Wight Ic.*, 1158. *Vern.*—Hemságar (*Sans., Hind., Beng.*), Zakhmhyát, Parna-bij (*Bomb.*), Mala-kulli (*Tam.*) The succulent leaves of this plant, like of those of B. calycinum, are valued as an application to wounds and sores ; they allay irritation and promote cicatrization. Ainslie says, " I can myself speak of their good effects in cleaning (ulcers) and allaying inflammation." In the Concan the juice of the leaves is given in bilious diarrhœa and lithiasis.

Description.—Leaves decompound and pinnatifid, the segments oblong-acute, coarsely toothed, upper ones nearly entire; sepals lanceolate acuminate, spreading; cyme, panicled; flowers yellow. Wild on the hills near Dharwar. (*Bomb. Flora.*) It is cultivated in gardens on account of its medicinal virtues.

UMBELLIFERÆ.

Hydrocotyle asiatica, *Linn., Wight Ic., t.* 565; *Bentl. and Trim., t.* 117. The plant.

Vernacular.—Bráhmamanduki, Khulakhudi, Brahmi (*Hind.*), Thalkuri (*Beng.*), Karivana, Karinga (*Bomb.*), Vallárai (*Tam.*)

History, Uses, &c.—In Sanskrit works this plant is called Mandukaparni, and is described as a useful alterative and tonic in diseases of the skin, nervous system, and blood. Chakradatta directs the fresh juice to be given with milk and liquorice. The plant was known to Rheede by its Malayalim name of Codogam or Kutakan, and also to Rumphius. Ainslie informs us that an infusion of the toasted leaves in conjunction with fenugreek is given to children suffering from bowel complaints and fever in doses of half a teacupful, also that the leaves on the Coromandel Coast are applied to parts that have suffered from blows and bruises, having, it is supposed, the power of keeping off inflammation. In Java, according to Horsfield, they are considered diuretic, and on the Malabar Coast the plant is one of the remedies for leprosy. As a remedy in this disease it was first brought prominently to notice by Lépine (1853) and Boileau. Dr. A. Hunter, who tried it in the Madras Leper Hospital (1855), came to the conclusion that it had no claim to consideration as as pecific in leprosy, but he found it most useful in ameliorating the symptoms and improving the general health. In the Pharmacopœia of India it has been made official, and is described as an alterative, tonic and local stimulant, more especially useful in syphilitic skin diseases, in which it may be used both as an internal and local remedy. Directions for making a powder and poultice are given. Recent reports from Europe (1885) confirm this statement, and there has been some enquiry for the drug in Bombay which has led to its cultivation on a small scale. In the neighbourhood of Bombay the plant is rare in a wild state, but may often be seen in gardens; it is a popular remedy for the slight dysenteric derangements of the bowels to which children are subject; 3 to 4 leaves are given with cummin and sugar, and the pounded leaves are applied to the navel. In the Concan one or two leaves are given every morning to cure stuttering; and the juice is applied to skin eruptions supposed to arise from heat of blood.*

Description.—The plant grows freely all the year round if watered, sending out long runners like the strawberry, which produce leaves, roots and fruit at the joints. The peduncles and petioles are fascicled; the latter are frequently three to four inches long; the peduncles are very short, and bear a 3 or 4-flowered simple umbel with very short rays; the leaves are reniform, crenate, ½ to 2 inches in diameter, 7-nerved, glabrous, or when young somewhat hairy on the under side; the fruit is laterally compressed, orbicular, acute on the back; the mericarps reticulated, sometimes a little hairy, with 3 to 5 curved ribs; they have no vittæ. The fresh herb has an aromatic somewhat ivy-like odour when crushed and a nauseous bitter taste, but these qualities are to a great extent lost in drying.

Chemical composition.—Hydrocotyle has been analysed by Lépine of Pondicherry, who found in it a peculiar body which he named Vellarin, and described as being obtainable from the dry plant to the extent of 0·8 to 1·0 per cent. It is an oily non-volatile liquid, with the odour and taste of the fresh herb, soluble in spirit, ether, caustic ammonia, and partially in hydrochloric acid. The authors of the Pharmacographia remark that these singular properties do not enable us to rank Vellarin in any well characterised class of organic compounds; moreover, they failed to obtain anything like it from the dry herb. The alcoholic extract is almost entirely soluble in warm water, and contains much tannin.

Commerce.—The dry herb is kept by the druggists. Value Rs. 7-9 per Surat maund of 37½ lbs. It is said to be brought from Calcutta and Cawnpore, and is generally much mixed with grass and weeds.

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* Generally as a *lép* with Cadamba bark, Ghi, and Black Cummin.

Conium maculatum, *Linn., Bentl. and Trim., t.* 118. The fruit.

Vernacular.—Showkrân (*Arab.*), Kírdamâna* (*Bomb.*)

History, Uses, &c.—I have met with no mention of Hemlock in Hindu works on Materia Medica. The Arabs and Persians appear to have derived their knowledge of its medicinal properties from the Greeks, whose works they quote. Ibn Baitar gives Koniyun as the Greek and Shikuta as the European name of the plant. Mír Muhammad Husain (Makhzan-el-Adwiya, article Showkrân,) informs us that the best Hemlock is obtained from the Koh-i-Taft near Yezd, and that the Persians call it Dúras-i-Tafti on this account; other Persian names are Karwaya-i-dashti and Tukm-i-tokhra. Mahometan writers describe the drug as intoxicating and narcotic, and say that two dirhems will have a fatal effect, producing insensibility of the extremities, which gradually extends to the nervous centres and puts a stop to respiration. The antidotes they recommend are stimulants, such as wine and spices. An extract made by expressing the juice of the unripe fruit is said to be a valuable preparation, and is recommended as a local application to tumours, &c.†

The Arabians also notice the antaphrodisiac properties of the plant. The Kírdamâna of the Bombay shops does not appear to have been utilized by Europeans; it comes from Persia, and is always obtainable in quantity in the Bombay market. With it an efficient preparation of Hemlock (the Ext. Conii fructus fluid., U. S. P.,) may always be prepared without recourse to Europe.

Description.—Kírdamâna resembles English Hemlock fruit, with the exception that it is a little larger and of a darker grey colour; sections of both compared under the microscope show a similar structure, *viz.*, that described in the Pharmacographia. When crushed in a mortar with caustic potash it has the same offensive smell as the English drug. The slight difference in size and colour is probably due to climatic influences.

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* Kurdumâna according to the Burhân, where it is described as wild caraway, mountain caraway, Syrian caraway and Turkish caraway. The author of the Makhzan describes Kurdamâna as an aromatic seed, and does not identify it with Conium.

† Compare with Dioscorides iv., 77 and vi., 11; also Pliny 25, 13.

Chemical composition.—The most important constituent of the fruits of Hemlock Conïa, $C^8 H^{14} NH$, is a limpid, colourless, oily fluid, sp. gr. 0·846 at 12°·5 C. It has a strong alkaline action, and boils at 170° C. in an atmosphere devoid of oxygen, without decomposition. To obtain it an alcoholic extract is submitted to distillation with a little slaked lime. The product should be neutralized with oxalic acid, and the oxalate of conia removed by absolute alcohol mixed with a little ether. The oxalate of the alkaloid shaken with caustic lye and ether, affords the conia on evaporating the solvent and distilling the alkaloid in a current of dry hydrogen. In the plant it is combined with an acid, and accompanied by ammonia, as well as by a second less poisonous crystallizable base, called Conhydrine, $C_8 H_{17} NO$, which may be converted into conia by abstraction of the elements of water. From these alkaloids a liquid non-poisonous hydrocarbon Conylene, $C^8 H^{14}$, has been separated by Wertheim. Even in nature one hydrogen atom of conia is frequently replaced by methyl, CH^3; and commercial conia commonly contains, as shown by A. von Planta and Kekulé, mythyl-conia, $C^3 H^{14} N C H^3$. Lastly, there is present in Hemlock fruits a third alkaloid having probably the composition $C_7 H_{13} N$. The yield of conia at the best is only 1-5th per cent.

The fruits of Hemlock contain also a volatile oil which appears devoid of poisonous properties; it exists in but small quantity, and has not yet been fully examined. (Pharmacographia, 2nd Ed., p. 300.)

Commerce.—The Persian seed is sold for Re. ½ per lb.

Carum copticum, *Benth., Wight Ic., t.* 566; *Jacq. Hort. Vind., tt.* 52, 200; *Bentl. and Trim., t.* 120. The fruit.

Syn.—Ptychotis ajwan.

Vernacular.—Ajwain (*Hind.*), Ajwán, Owa (*Bomb.*), Oman (*Tam.*)

History, Uses, &c.—Bishop's weed has been in use in India as a condiment and medicine from a very remote period; we find it mentioned by the early Sanskrit writers under the name of Yamani. It is the Nánkhwah of Ibn Siná. The Persians call it Zinián and Nánkhwah, a name derived from Nan, bread, and Khwah, desire, and given to it on account of its stimulating effect on the appetite. The author of the Persian Dictionary, Burhán-i-kátia, gives Tálib-el-khubz as the Arabic name, which is equivalent to the Persian Nánkhwah. In the Makhzan-el-Adwiya, Kamun-el-muliki is given as the Arabic,[*] and other writers again give different synonyms, so that there is a difficulty in deciding which of the notices in Arabic works have reference to this drug. As pointed ont by Flückiger and Hanbury, the fruits of Ammi majus, *L.*, and Sison amomum, *L.*, have often been confounded with it. The Tuhfat-el-muminín gives Ammi as the Greek name of Ajwan.

In native practice, Ajowan is much used as a carminative, either alone or in combination with rock salt, asafœtida, myrobalans, &c. It is also thought to check discharges of a chronic kind, and is therefore used in making lotions, collyria, &c.; upon the same principle it is prescribed in bronchitis with copious expectoration. A plaster or poultice of the crushed fruit is said to relieve pain. The *Ark* or distilled water of Ajowan is prepared and sold in the bazars.

Description.—The fruits are of the size and shape of those of parsley, of a greyish-brown colour, with a tubercular surface. Each mericarp has five prominent ridges, the intervening channels being dark brown, with a single vitta in each. The commissural side bears two vittæ. The odour resembles that of thyme.

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[*] Dioscorides mentions *βασιλικὸν κύμινον* as a synonym for the *αμμι* of the Greeks. (iii., 63.), which appears to have been used by them just as Ajwán is now in India as a domestic remedy.

Chemical composition.—The following summary is extracted from the Pharmacographia:—"The fruits according to Stenhouse (1855) yield 5 to 6 per cent. of an agreeably aromatic, volatile oil, sp. gr. 0·896. At the same time there collects on the surface of the distilled water, a crystalline substance, which is prepared at Oojein and elsewhere in Central India, by exposing the oil to spontaneous evaporation at a low temperature. This stearoptene, sold in the shops of Poona and other places of the Deccan, under the name of Ajwain-ka-phul, *i.e.*, flowers of Ajwain, was first made known by Stocks, and was examined by Stenhouse and by Haines, who showed its identity with thymol, $C_6\ H_3 \left\{ \begin{array}{l} OH \\ CH^3 \\ C^3\ H^7. \end{array} \right.$ as contained in Thymus vulgaris.

"We obtained it by exposing oil of our own distillation, first rectified from chloride of calcium, to a temperature of 0° C., when the oil deposited 36 per cent. of thymol in superb tabular crystals, an inch or more in length. The liquid portion even after long exposure to a cold some degrees below the freezing point, yielded no further crop. We found the thymol thus obtained began to melt at 44° C., yet using somewhat larger quantities, it appeared to require fully 51° C. for complete fusion. On cooling, it continues fluid for a long time, and only recrystallizes when a crystal of thymol is projected into it.

"Thymol is more conveniently and completely extracted from the oil by shaking it repeatedly with caustic lye, and neutralizing the latter. The oil of Ajwan, from which the thymol has been removed, boils at about 172°, and contains cymene (or cymol), $C^{10}\ H^{14}$, which with concentrated sulphuric acid, affords cymen-sulphonic acid, $C^{10}\ H^{13}\ SO^2\ OH$. The latter is not very readily crystallizable, but forms crystallized salts with barium, calcium, zinc, and lead, which are abundantly soluble in water. In the oil of Ajwan no constituent of the formula $C^{10}\ H^{16}$ appears to be present. The residual part of the oil from which the cymene has been distilled, contains another substance of the phenol class different from thymol. Neither thymol nor the liquid part of Ajwan oil possesses any rotatory power."

Commerce.—Ajowan fruit is brought to Bombay from Marwar, where it is cultivated. Value Rs. 2⅞ per pharrah (about 35 lbs.)

The crystalline essential oil (Ajwán-ka-phúl) comes from Oojein. Value, Rs. 8 per lb.

In 1881-82, Bombay exported 1,195 cwts. of the seeds, valued at Rs. 6,066. Of this quantity, 284 cwts. went to the United Kingdom, and the rest to eastern ports.

Carum carui, *Linn.*, *Bentl. and Trim.*, *t.* 121. The fruit.

Vernacular.—Wilayatí-zírah (*Hind.* and *Bomb.*), Kékkuvirai, Shimai-shombu (*Tam.*)

History, Uses, &c.—The Caraway is cultivated in Armenia and the Caucasian provinces, and has been found growing wild in the high Alpine region of Lahul in the Western Himalaya. It does not appear to have been known to the older Hindu writers, but the Arabians were well acquainted with it, and we find it described in Arabic and Persian works under the names of Karawya or Kuruya,* Zirah-i-Rumi, and Zirah-i-Armani. The Mahometans do not appear to have introduced it into India to any extent, and there was probably little demand for it until the English became masters of the country. The natives seldom use it, as they have a variety, the Carum nigrum (*Vern.* Sájíra or Siahzírah), which they have long been accustomed to. Mahometan writers describe the fruits as aromatic, carminative and astringent; from them they prepare an eyewash, which is supposed to strengthen the sight; they are also used as a pectoral, and considered diuretic and anthelmintic. A Caraway bath is recommended for painful swelling of the womb, and a poultice for painful and protruding piles.

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* Said in the Makhzan to be derived from the Syrian Kârui. The author of the same work identifies it with the *κάρος* of Dioscorides, but gives *arhamiyun* as the Yunani name.

Description.—The fruits are ovoid, slightly arched, laterally compressed, crowned by the style; they vary in size, but are generally about 1-6th of an inch long and 1-20th in diameter. The colour is brown, but the ribs are of a lighter colour than the furrows. The mericarps are generally separated; each on transverse section is seen to have five ridges, and to be of a pentagonal form with unequal sides; between the ridges are four vittæ, the commissural side being provided with two, which are placed close together. Within the pericarp is the seed, which is conform to the fruit. Caraways have a powerful odour like Cummin, but more agreeable.

Chemical composition.—The reader is referred to the Pharmacographia and other standard works on Materia Medica.

Commerce.—Caraways are brought to Bombay from the Red Sea ports. Value, Re. 1 per lb.

Carum nigrum, *Royle*, *Vern.*—Sájíra, or Siáh-zírah (*Bomb.*), has more slender and darker-coloured fruits than the Caraway; a transverse section shows a similar structure. The flavour approaches that of Cummin, and the Persian name which it bears signifies black cummin. It is probably the article described in Persian works on Materia Medica as Kirmáni, or black cummin. In Western India it is used mostly by the Mahometans as a spice, but also to some extent by the Marathas.

Siáh-zírah is imported in large quantities from the Persian Gulf ports, average value Rs. 8 per Surat maund of 37½ lbs. Royle states that it is also brought into India from Kunawar. In 1881-82 the imports into Bombay from Persia amounted to 2,683 cwts., valued at Rs. 71,886. The exports were 5 cwts. to Mauritius and 4 cwts. to Aden.

Cuminum cyminum, *Linn., Bentl. and Trim., t.* 134. The fruit.

Vernacular.—Zíra (*Hind.*), Jíra (*Beng.* and *Bomb.*), Shiragam (*Tam.*)

History, Uses, &c.—This fruit, called in Sanskrit Jiraka, is much used as a condiment by the Hindus; they regard it as stomachic, carminative and astringent, and prescribe it in chronic diarrhœa and dyspepsia. It is thought to be very cooling, and on that account forms a part of most prescriptions for gonorrhœa. It is also used as an external application to allay pain and irritation. Arabian and Persian writers describe four kinds of Kamún, *viz.*, Farsi or Persian, Nabti or Nabathean, Kirmáni or black cummin, which they say is the Basilikon of the Greeks, and Shámí, or Syrian.* They consider it to have the same properties as the Caraway.

Description.—The fruit consists of two mericarps which remain united together when dry, and form an elongated ovoid body about ¼ inch long and 1-10th broad in the middle, surmounted by the styles; each mericarp has five primary ridges and four secondary, the vittæ are six in number, two of them being situated on the commissural side; the seed is pentangular with rounded angles.

Chemical composition.—Cummin fruits yielded to Bley (1829) 7·7 per cent. of fat oil, 13 per cent. of resin (?), 8 of mucilage and gum, 15·5 of albuminous matter, and a large amount of malates. Their peculiar, strong, aromatic smell and taste depend on the essential oil, of which they afford about 4 per cent. It contains about 56 per cent. of Cuminol (or Cuminaldehyde), $C^6 H^4 \left\{ \begin{matrix} CHO \\ C^3 H^7 \end{matrix} \right.$, a liquid of sp. gr. 0·972, boiling point 237° C. Trapp has shown that the fruits of Cicuta virosa, *L.*, also contain cuminol. Oil of cummin is a mixture of cymol or cymene, $C^{10} H^{14}$, having a sp. gr. 0·867 and boiling point 177° C.; and cuminol or cumin-aldehyde, $C^{10} H^{12} O$ of sp.

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* Compare with Dioscorides περί κυμίνου ἡμέρου και ἀγρίου, iii., 61 and 62; perhaps one of his kinds of cummin may have been a caraway. See also Cuminum in Pliny 20, 14.

gr. 0·972, boiling point 236° C., the proportion of the latter in the crude oil being about 56 per cent. It also contains the hydrocarbon, $C^{10} H^{16}$, according to Warren (1865), and Beilstein and Kupffer (1873).

Cuminol possesses the smell and taste of cummin, while the odour of cymol more resembles that of lemons. Oil of cummin deviates a ray of polarized light 10·2° to the right; the optical power of each of its constituents is nearly the same, that of cuminol being the less strong. Cymol may also be obtained by submitting coal-tar to dry distillation, or by distilling camphor with anhydrous phosphoric acid or dry chloride of zinc. Oppenheim (1872) has shown that oil of turpentine is to be considered as a hydride of cymol, and has indeed transformed terpin, the crystallized hydrate of the former, into cymol. In the oil of Thymus vulgaris, *L.*, cymol exists ready formed.

Cuminol manifests the chemical properties of an aldehyde, inasmuch as it combines with alkaline bisulphites, and is easily transformed by oxidizing agents into the crystallizable cuminic or cumic acid, $C^{10} H^{12} O^{2}$. It also slowly oxidizes under the influence of air and water, yielding the same product.

Commerce.—Cummin comes from Jubbulpore, Guzerat, Rutlam and Muscat. Value, Rutlam, Rs. 8 to Rs. 9 per Surat maund of 37½ lbs.; Muscat, Rs. 6 to Rs. 6½; Guzerat, Rs. 3 to Rs. 7½; Jubbulpore, Rs. 3 to Rs. 6. In 1881-82 the exports from Bombay all to eastern ports amounted to 5,558 cwts., valued at Rs. 79,312.

Apium graveolens, *Linn.*, *Eng. Bot. xvii.*, *t.* 1210. The fruit.

Vernacular.—Karafs, Borí-ajmúd (*Arab.*, *Hind.*, and *Bomb.*)

History, Uses, &c.—Wild Celery does not appear to have been known to the ancient Hindus. The Arabians probably obtained their knowledge of it from the Greeks. Dioscorides describes five kinds of *σελίνον.* Sprengel refers two of these to Apium graveolens, *viz.*, *σελίνον κηπαῖον* and *ἐλειοσέλινον*, var. sativum et sylvestre.* Muhammad Husain, who wrote in India about one hundred years ago, informs us that Karafs is the Celery of the Europeans and the Udasaliyun of the Greeks. He describes three other kinds, *viz.*, Sakhrí, in Greek Fiturasaliyun; Nabti, in Greek Akúsaliyun; and Tari, in Greek Shamaríniyun. What all of these may be, it is difficult to decide. Fiturasaliyun is now the bazar name in Bombay for the fruits of Prangos pabularia, but it is evidently a corruption of the Greek Petrosilinon, and had once a different meaning, being described in Arabic works as like Ajowan.† The fruits imported into Bombay from Persia under the name of Karafs, and sold in the bazars as Borí-ajmúd, agree in structure with those of A. graveolens, *L.*, the Ache des marais of the French, and Smallage Parsley of the English. Mahometan writers describe Karafs as deobstruent and resolvent, and use it in the form of a poultice with barley meal; they recommend it internally as a pectoral and as a tonic and carminative adjunct to purgatives, also as a diuretic, emmenagogue, lithontriptic, and alexipharmic. The seeds and herb yield a colourless or pale yellow essential oil, sp. gr. 0·881.

Description.—Karafs or Borí ajmud imported into Bombay from Persia is a very small fruit, which, when the two mericarps are united, as is often the case, is almost globular; it is quite smooth and remarkable for the size and prominence of its ridges; the vittæ are 11 to 12 in number, two of these are on the commissural side. The taste is at first like anise, but afterwards bitter. The odour like anise, but faint.

Chemical composition.—Celery seeds, like those of parsley, contain *Apiin*, a substance first obtained by Rump in 1836 from the leaves, stalks and seeds of common parsley; it was afterwards more exactly examined by Lindenborn, who obtained it by careful evaporation of the alcoholic solution, in needles which gave by analysis 54·71—55·25 per cent. carbon, and 5·49—5·60 hydrogen, and further showed that it is a glucoside, splitting up, when boiled with dilute Sulphuric acid, into glucose and Apigenin (66·13 per cent. C. 3·9 H). From these numbers Lindenborn inferred that Apigenen is isomeric with quinone, and assigned to apiin the formula $C^{12} H^{14} O^{7}$, representing its decomposition by the equation, $C^{12} H^{14} O^{7} + H^{2} O = C^{6} H^{4} O^{2} + C^{6} H^{12} O^{6}$. Quite recently apiin has been further examined by E. v. Gerichten (Deut. Chem. Ges. Ber. IX., 1121), whose results agree in the main with those of Lindenborn, his analysis of apiin giving 53·55 per cent. C., 5·36 H., and that of apigenin 65·12—66·21 C., and 3·75—3·91 H.

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* Conf. Dios. iii., 67, 68, 69, 70, 71. The Ancients made chaplets of celery, which were given to the victors at the Isthmian and Nemean games, and hung upon tombs. It is the Apium of Pliny 19, 8.

† Adams considers πετροσέλινον to be the Stone Parsley, Petroselinum macedonicum, still cultivated in Europe.

Apiin is slightly soluble in cold, easily in hot water, still more easily in hot alcohol, insoluble in ether; from the aqueous or alcoholic solution it always separates by slow cooling in the form of a jelly. It dissolves in alkalies with a light yellow colour. Its hot aqueous solution gives no precipitate with silver nitrate, lead nitrate, or copper sulphate, a brown-red precipitate with ferric chloride, a blood-red coloration with ferrous sulphate. Apiin is the most powerfully dextrogyrate of all known substances, its specific rotatory power for yellow light being + 173°. (Gmelin's Handb. 16, 94; Watt's Dict. of Chem. VIII., Pt. I., 117.)

Apiol or Parsley camphor which has lately been obtained from Parsley seeds, will probably be found in those of Celery; it has been used as an emmenagogue.

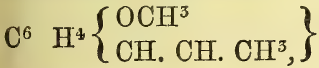
Commerce.—Value, Rs. 6 per Surat maund of 37½ lbs.

Fœniculum vulgare, *Gärtn., Bentl. and Trim., t.* 123. The fruit and root.

Vernacular.—Bari saunf (*Hind.*), Bari-shopha (*Bomb.*), Panmohuri (*Beng.*), Wariárí (*Guz.*)

History Uses, &c.—Indian Sweet Fennel is rather smaller and straighter than the European article, but in other respects is similar to it. Fennel fruit is used by the natives of India as a condiment and as an aromatic adjunct to medicines. A distilled water, known as Ark-i-bádián, is prepared from it. The Sanskrit name is Madhurika. As pointed out by Mr. M. Sheriff in his Appendix to the Pharmacopœia of India, this plant and the anise have been confounded together in Arabic and Persian works on Materia Medica. In Bombay the Persians call the fruits of both Rázianah. But the Hindu dealers call Fennel Wariarí and Anise Erva-dos. The root of Fennel is rather an important medicine in native practice, being to the present day esteemed as one of the five opening roots of the ancients.*

Description.—The fruits are oblong, cylindrical, about 3-10th of an inch long and 1-10th in diameter, nearly straight, terminating with the two-pointed base of the style, and smooth on the surface. Each mericarp has five prominent ridges. Between the ridges are the vittæ, and there are two on the commissural surface. The colour of the fruit is a pale greenish yellow, the odour like that of anise, and the taste sweet and aromatic.

Chemical composition.—Fennel fruit yields about 3 per cent. of volatile oil, which consists of anethol or anise camphor,  $C^6\ H^4 \left\{ \begin{matrix} OCH^3 \\ CH.\ CH.\ CH^3, \end{matrix} \right\}$ and variable proportions of a liquid isomeric with oil of turpentine. Anethol is obtainable from Fennel in two forms, the solid and the liquid; crystals of the former are deposited when the oil is subjected to a somewhat low temperature; the liquid anethol may be got by collecting the portion of the crude oil passing over at 225 C. The crystals of anethol fuse between 16 and 20° C., the liquid form of anethol remains fluid even at —10° C. By long keeping the crystals slowly become liquid, and lose their power of reassuming the crystalline form. (Pharmacographia, p. 275.)

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* The five opening roots are Fennel, Parsley, Wild Celery, Asparagus and Butcher's broom (Ruscus aculeatus). The wild bitter Fennel is probably the μαραθρον of Dioscorides (iii., 74) and the Fœniculum of Pliny (20, 23); it was used as an emmenagogue, and is mentioned by Hippocrates in his first book upon the Diseases of Women.

Commerce.—Fennel fruit comes to Bombay from Jubbulpore, Kupperwanj and Khandesh. Value, Rs. $3\frac{7}{8}$ per Surat maund of $37\frac{1}{2}$ lbs. The exports in 1881-82 were 2,201 cwts., valued at Rs. 16,630 ; only 5 cwts. went to the United Kingdom, and the rest to eastern ports.

Anethum graveolens, *Linn., Bentl. and Trim., t.* 132. The fruit.

Vernacular.—Sowa (*Hind.*), Suva, Shopha, Shepu (*Bomb.*), Shoyikirai-virai, Shatakuppi-virai (*Tam.*)

History, Uses, &c.—Dill seed is much esteemed by the natives of India, who use it as a condiment and medicine. An infusion of it is given as a cordial drink to women after confinement. The leaves moistened with oil are used as a stimulating poultice or suppurative. The Sanskrit name is Misreyá. Mahometan writers describe Shibbit as resolvent and deobstruent, carminative, diuretic, and emmenagogue. The Persian name is Shúd, and the Yunáni Anitún.*

Description.—The fruits of the Indian plant, which has by some been called A. sowa, do not differ in any important respect from those of the European plant. The mericarps are somewhat narrower and more convex, the ridges more distinct, and the border less winged.

Chemical composition.—Dill fruits yield from 3 to 4 per cent. of an essential oil, a large proportion of which was found by Gladstone (1864-72) to be a hydrocarbon, $C^{10} H^{16}$, to which he gave the name Anethene. This substance has a lemon-like odour, sp. gr. 0·846, and boils at 172° C. It deviates a ray of polarized light strongly to the right. Nietzki (1874) ascertained that there is, moreover, present another hydrocarbon, $C^{10} H^{16}$, in a very small proportion, which boils at 155 to 160°. A third constinuent of oil of Dill is in all probability identical with carvol. (Pharmacographia, 2nd Ed., p. 328.)

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* Compare with Dioscorides *περὶ ανηθου* (iii., 60). It is the Anethum of Pliny (19, 8).

Commerce.—Suva is cultivated in the Deccan. Value, Rs. 3⅝ per pharrah (about 35 lbs.). In 1881-82, Bombay exported 366 cwts., valued at Rs. 1,513 ; of this 291 cwts. went to the United Kingdom.

Coriandrum sativum, *Linn., Bentl. and Trim., t.* 133.

The fruit.

Vernacular.—Dhanya (*Hind.*), Dhanya, Dhana (*Bomb.*), Kotamalli (*Tam.*)

History, Uses, &c.—The Coriander plant in Western India is called Kothmir ; when young it is much used in preparing chutnies (sauces). The fruits are largely used by natives as a condiment ; as a medicine they are considered carminative, diuretic, tonic, and aphrodisiac, and are often prescribed in dyspepsia. A cooling drink is prepared from the fruit pounded with Fennel fruit, Poppy seeds, Kanchan flowers, Rosebuds, cardamoms, cubebs, almonds and a little black pepper; it is sweetened with sugar. Mahometan writers describe them as sedative, pectoral and carminative ; they prepare an eyewash from them which is supposed to prevent small-pox from destroying the sight, and to be useful in chronic conjunctivitis. Coriander is also thought to lessen the intoxicating effects of spirituous preparations, and with Barley meal to form a useful poultice for indolent swellings. It is the Kuzbura of the Arabs and Kishníz of the Persians, who identify it with the Koriyun of the Greeks.*

Description.—Indian Coriander is much larger than that grown in Europe, and of an ovoid form ; it consists of two mericarps firmly joined together, they are crowned by the stylopodium and calicinal teeth. Hanbury and Flückiger have the following excellent description of the fruit :—" The pericarp bears on each half four perfectly straight sharpish ridges, regarded as secondary (juga secundaria) ; two other ridges, often of darker colour, belonging to the mericarps in common, the separation of which takes place in a rather sinuous line. The shallow depression between each pair of these straight ridges is occupied by a zigzag raised line (jugum primarium), of which there are therefore 5 in each mericarp. It will thus be seen that each mericarp has five (zigag) so-called primary ridges, and four (keeled and more prominent) seconpary, besides the lateral ridges, which mark the suture or line of separation. There are no vittæ on the outer surface of the pericarp. Of the five teeth of the calyx, two often grow into long pointed, persistent lobes; they proceed from the outer flowers of the umbel. Though the two mericarps are closely united, they adhere only by the thin pericarp, enclosing when ripe a lenticular cavity. On each side of this cavity, the skin of the fruit separates from that of the seed, displaying the two brown vittæ of each mericarp. In transverse section, the albumen appears crescent-shaped, the concave side being towards the cavity. The carpophore stands in the middle of the latter as a column, connected with the pericarp only at the top and bottom."

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* Confer. Dios. *περι κορίου*, iii., 64 ; and Pliny 19, 7 for Coriandrum.

Chemical composition.—The essential oil is isomeric with Borneol, formula $C^{10} H^{18} O$. According to Kawalier, if the elements of water are extracted by phosphoric anhydride, it is converted into an oil of offensive odour, formula $C^{10} H^{16}$.

The fruits yield from 0·7 to 1·1 per cent. of volatile oil and 13 per cent. of fixed oil.

Flückiger obtained from the green herb from 0·57 to 1·1 per mille of an oil having an offensive odour, which deviated the ray of polarized light 1·1° to the right when examined in a column of 50 mm. long. The oil distilled by him from ripe fruit deviated 5·1° to the right.

Commerce.—Indian Coriander is worth about Rs. 3 per pharrah (about 35 lbs.) In 1881-82, Bombay exported 6,484 cwts., valued at Rs. 34,018, all to eastern ports.

Pimpinella anisum, *Linn., Bentl. and Trim., t.* 122. The fruit.

Vernacular.—Saunf (*Hind.*), Erva-dos (*Bomb.*), Perunshiragam, Shombu (*Tam.*)

History, Uses, &c.—Anise does not appear to have been known to the ancient Hindus, and is not mentioned in Sanskrit works. It was introduced into India by the Mahometans from Persia, whence the supply for the Bombay market still comes. Anise is now grown in Northern India.

The natives use anise in the same way as we do. The Persians call it Báziánah, which the Arabs corrupt into Báziánaj. They identify it with the Anisún of the Greeks.* The Bombay name, Ervados, is a corruption of the Portuguese 'Herba doce.'

Description.—The fruit varies a good deal in size; if well grown it should be about 2-10th of an inch long. The mericarps often adhere together with the pedicel attached, forming an ovoid body crowned by a pair of styles. Each fruit has 10 ridges, and is covered with short hairs. The taste is remarkably sweet and aromatic. The vittæ, which contain the essential oil, are very numerous, each mericarp being provided with about fifteen.

Chemical composition.—The fruit yields from 2 to 3 per cent. of essential oil, which is a colourless liquid, but after a time becomes yellow. It has the taste and odour of the fruit, sp. gr. 0·977 to 0·983. At from 10 to 15° C. it becomes a crystalline mass. Oil of anise resembles oil of fennel (*vide* Fennel) in that it consists almost entirely of anethol.

Commerce.—Anise is imported from Persia. Value, Rs. 5 to Rs. 6 per Surat maund of 37½ lbs.

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* Comp. Dios, *περὶ ανίσου* iii., 58; and Plin. 20, 17 and 19, 8 for Anisum.

Carum Roxburghianum, *Benth.*, *Wight Ic.*, *tt.* 567,335. The Apium involucratum of Roxburgh and Ptychotis Roxburghiana of *D. C. Vern.*—Ajmúd (*Hind.*), Rándhani (*Beng.*), Karonza (*Bomb.*), Asham-tagam (*Tam.*), is used much in the same manner as parsley, and is a fair substitute for that garnish, which it resembles in taste, with the addition of a flavour of anise. The fruit is carminative; its structure resembles that of anise, each mericarp being provided with about 15 vittæ and five ridges, which are paler than the spaces between them. The surface of the fruit is studded with simple blunt hairs.

It is not an article of commerce in Bombay. The Sanskrit name is Ajamoda.

Prangos pabularia *Lindl.*, *Wall. Pl. As. Rar. ii.* 7, *t.* 212. The fruit.

Vernacular.—Prangos, Komal (*Pushtu*), Fiturasaliyun (*Bomb.*)

History, Uses, &c.—The late Dr. Royle was of the opinion that this plant was probably the kind of Silphium mentioned by Arrian in his account of the wars of Alexander. "In this part of the Caucasus (the modern Hindu Kush) nothing grows except pines and silphium; but the country is populous, and feeds many sheep and cattle, for the sheep are very fond of the silphium. If a sheep should perceive the silphium from a distance, it runs to it and feeds on the flower and digs up the root and eats that also." The Prangos is highly valued in the cold and arid region of Thibet, where it is indigenous; it is also found in Cabul and Cashmere, but is not so vigorous there as in its Thibetan home, nor is it so highly esteemed, as these countries abound in pasture of every description. The Prangos will, therefore, most probably be a valuable acquisition only in countries devoid of good natural pasturage, and which have a bleak and barren aspect. In Cashmere the fruit is used in decoction to cure the rot in sheep. The plant is used as fodder, but is considered heating. In Bombay the hakíms use the fruit as a stimulant, carminative, and diuretic; it is also said to promote the expulsion of the fœtus. Faturasaliyun is an Arabic corruption of Petrosilinum; it is still further corrupted by the Bombay druggists into Phattarsálam. The notices under this name in Arabic and Persian works treat of a small fruit like Ajowan; they cannot therefore refer to Prangos.

Description.—The fruit consists of a pair of mericarps about ¼ inch long, which together form an elongated oblong body crowned by the stylopodium and calycinal teeth; each mericarp has five very prominent convoluted ridges. The margins of the seeds are curved inwards, so that a transverse section shows a horseshoe-shaped object, surrounded by about 40 vittæ, full of yellowish brown essential oil. The taste is at first somewhat like anise, but afterwards bitter.

Commerce.—Value, Rs. 5 per Surat maund of 37½ lbs.

Peucedanum grande, *C. B., Clarke.* The fruit.

Syn.—Pastinaca grandis.

Vernacular.—Báphullí (*Bomb.*), Dúkú (*Hind.* and *Pers.*)

History, Uses, &c.—From the description of Dúkú in Arabic and Persian works we gather that it was a kind of wild carrot (Dúkú-ágria of the Greeks),* with small fruit and a finely divided leaf. The name itself is evidently a corruption of Daucus. In India this term has been transferred to quite a different plant. In Royle's Materia Medica, Falconer is quoted as describing Dúkú as a fruit resembling that of asafœtida, and as probably derived from some species of Ferula. The Dúkú of the Mahometan druggists of Bombay answers to this description; but the same fruit is called by the Hindus Báphullí. Three years ago I planted some of it, and this year (1880) it has produced a flowering stem, and proves to be the Pastinaca grandis of Dalzell and Gibson, a native of the Ghauts near Bombay. The fruit is carminative and stimulant, and is said to be diuretic.

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* Compare with Dioscorides περί δαύκου, iii., 76.

Description.—Plant three to seven feet high, having very much the appearance of a garden parsnip which has run to seed; root large, perennial, all quite smooth; leaves mostly radical, long-petioled, bipinnate; leaflets trilobate; lobes large, rounded; margins crenate serrate, shining on both sides; cauline leaves 1 to 2, biternate; stem round, smooth, striated, involucre and involucel leaves oblong or obovate, obtuse, partial rays numerous, many flowered; flowers yellow; fruit large, broadly elliptical, varying in size, the largest are ⅝ of an inch long and ⅜ broad; foliaceous, convex in the middle, with a dilated border, consisting of coarse cellular tissue; colour reddish yellow over the seed, margin pale yellow; dorsal ridges seven, the three central filiform; vittæ in dorsal furrows ten to thirteen; vittæ of commissure six. The fruit has a powerful lemon odour with a *soupçon* of carrot.

Chemical composition.—By distillation a light yellow essential oil was obtained with an odour like that of the fruit. Kemp obtained ¾ of an ounce by measure from 7 lbs. of fruit; its action on polarized light is dextrogyre, a column of 100 mm. rotating it 36 degrees.

Commerce.—The fruit is worth about Rs. 6 per pharrah (about 25 lbs.)

The seeds of **Daucus carota,** *Vern.*—Gájir-bij, are found in all the shops, and are used medicinally by the natives as they formerly were in Europe. The Arabic name of the carrot is Jazar, the Persian Zardak, and the Sanskrit Garjara. Under the name of Dúkús the author of the Makhzan describes three plants, one having fruits like Asafœtida, and leaves like celery, must be a Peucedanum; of the other two, one is said to resemble coriander, and to be also called Hashishat-el-barághíth; the other has foliage like coriander, but fruits like cummin. A decoction of carrot is a popular remedy for jaundice in Europe. Rasped carrot is applied to burns and foul sores. The dried peduncle is a favourite toothpick among the Arabs on account of its aroma. The fruits of wild carrot are substituted in Europe for those of Daucus cretica, which were one of the four minor cold seeds of the ancients. In the Concan a poultice of carrots and salt is used in tetter, and the seeds are eaten as an aphrodisiac.

Ferula alliacea, *Boiss.* The gum resin.

Vernacular.—Hing (*Hind.* and *Bomb.*), Kayam, Perungayam (*Tam.*)

History, Uses, &c.—We may consider this drug to be the medicinal Asafœtida of the natives of India, as the other kinds are comparatively seldom used. In Sanskrit it is called Hingu; Hindu medical writers direct it to be fried before being used. It is in great repute as a carminative and condiment among vegetarians, also as an antispasmodic in nervous affections. taken daily it is thought to ward off attacks of malarial fever; The Mahometans place Asafœtida amongst their aphrodisiacs and hypnotics, and consider the fruit (Tukm-i-anjudán) to be stimulant; they prescribe the drug in a great number of diseases both externally and internally. (Confer. Makhzan-el-Adwiya, articles Hiltít and Anjudán.) The old Greek and Latin authors mention two kinds of Silphium—one good or sweet, and the other fetid. Theophrastus, in his History of Plants (VI., 3), speaks of two varieties, *of the stem* and *of the root*. He says: *ὀπόν δὲ διττὸν ἔχει, τὸν μὲν ἀπὸ τοῦ καυλοῦ τὸν δέ ἀπὸ τῆς ῥιζης, δὶ δ᾽ καλοῦσι τὸν μὲν καυλίαν τὸν δε ῥιζιαν.* Dioscorides also mentions two kinds, one of which from his description seems to agree with Asafœtida.* The modern Arabian and Persian works speak of tyib (good) and muntin (stinking) Asafœtida, as being produced by two distinct plants, one called white Anjudán, which produces the first, and the other black Anjudán, which produces the second, and which grows about Herat. The gum of this kind is described as turning red, which proves its identity with the gum of European commerce. Guibourt was the first European writer to point out the difference between the Asafœtida of India known as Hing and that of the European Pharmacopœias, which is called in India Hingra. Vigier, who calls Hing Asafœtida nauséeux, found it to consist in 100 parts, of resin and essential oil 37·50, gum 23·75, remains of stalks (root?) 38·75. I am indebted to Mr. Ardeshir Mehrban, a merchant of Yezd, for most of the following particulars regarding the source of this drug. Mr. Ardeshir, having himself visited the hills where the plant grows, is able to speak from personal observation. The plant which produces the Asafœtida used in India (Darakht-i-Anghuzeh-i-khális) grows wild on the hills of Khorasán in very stony ground. The hill-men collect the gum-resin, taking an advance from the merchants. The time for collecting it is in the spring. The plant is not nearly so large as that which produces the Asafœtida of European commerce (Darakht-i-Anghuzeh-i-Lári), the diameter at the crown of the root being seldom more than two inches. The collectors protect each plant by building a small cairn of stones round it; they also remove the soil from the upper portion of the root, making a kind of circular basin. When the stem begins to grow it is cut down, and the upper part of the root being wounded, a small quantity of very choice gum is collected, which seldom finds its way into the market. Afterwards a slice of the root, about $\frac{1}{4}$ inch thick, is removed every two or three days with the exudation adhering to it, until the root is exhausted. The collected mass, consisting of alternate layers of root and gum-resin, when packed in a skin (in quantities of about 100 lbs.) forms the Hing of Indian commerce; it is imported into Bombay in large quantities (about 2,500 cwts. annually), and is valued at the Custom House for assessment at Rs. 55 per cwt., commercial Asafœtida (Hingra) being only valued at Rs. 20. Early in 1874, the late Mr. Hanbury was kind enough to forward to me the proof-sheets of the article upon Asafœtida in the 'Pharmacographia,' with a request that I would obtain further information upon the subject. Unfortunately this could not be done in time for publication in the first edition of that work, as it involved sending to Persia for specimens of the plant and drug. In August 1874, through the kindness of Mr. Ardeshir Mehrban,

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* Dioscorides speaking of Sagapenum says that it has an odour between that of Silphium and Galbanum (iii., 136).

I obtained the first box of specimens collected in the neighbourhood of Yezd. It contained—1*st*, the fresh root, with gum-resin adhering to the broken portions, and from which, upon section, a further exudation took place, at first opaque and milky, but drying in the course of a day or two into a light brown translucent substance; 2*nd*, the flower stem with flowers and very immature fruit; 3*rd*, the leaves. The plant arrived in a broken state, and was forwarded to Mr. Hanbury. Upon its receipt, he wrote:—" This morning I have devoted to the Asafœtida plant, and to a comparison of it with the figures and descriptions published by Borszczow, Balfour, and Hooker; but to decide on its botanical name is at present a difficult, if not impossible task. I suppose it to be either the Narthex of the Edinburgh garden, or the Scorodosma of Borszczow, admitting for the moment that these are two good species; but the specimen does not furnish all the characters requisite for a strict comparison. I cannot tell whether the plant has the great sheathing petioles that form so striking a feature of the Narthex, nor is it possible to say whether the flower stem bore umbels arranged in a tall regular obelisk as Narthex, or crowded towards the summit as in Scorodosma. The foliage might do for either plant, though in having shorter segments it better agrees with the latter. The inflorescence which I have soaked and dissected consists of fertile female, and abortive flowers, none staminiferous. They are remarkably glabrous, not pubescent, as in Borszczow's plant; but this is of small moment."

Early in 1875, I was able to send another box of specimens, with ripe fruit and a large supply of leaves. In acknowledging it, Mr. Hanbury wrote:—" The box containing the Asafœtida plant arrived on the 29th January in excellent order, and its contents have given me great pleasure. The large plant, though it had been rudely broken up and stuffed into a narrow space, proved to be fairly perfect; and by soaking in cold water I was able to restore it to shape, and then to fix it together so as to make a really beautiful specimen, measuring three feet six inches in height. The leaves, also, by soaking them and taking some pains, form very decent herbarium specimens, and there are enough of them to supply several collections. But the chief point with me has been to determine the plant. From the foliage, the pink colour of the stem, and the size of the fruit, I judged it might be the Ferula alliacea of Boissier; but there being no specimen of this at Kew, I had to transmit a portion of yours to M. Boissier, in Switzerland. His reply was definite. The plant from Yezd agrees in foliage exactly with F. alliacea, in stature, size of fruit, and other respects ; but the fruit has a broader margin than in M. Boissier's specimens. However, M. Boissier thinks it may be set down as that species, a conclusion in which I entirely agree. Ferula alliacea was previously known to me only by description. You will observe that we have named it in the 'Pharmacographia' as a possible source of Asafœtida. I have thought it right to make a wide distribution of the fine supply of seeds with which you have favoured me, and I have therefore sent packets to the Botanical Gardens of Kew, Edinburgh, Oxford, Paris, St. Petersburg, Bern, Strassburg, Florence, Pisa, Naples, Palermo, Athens, and to botanical friends on the Mediterranean Coast, in South Africa, and a few other places. As the seeds seemed fresh and good, I am in hopes that many plants may be raised."

Chemical composition.—According to Hirschsohn, Asafœtidas may be divided into two groups—*viz.*, those which yield umbelliferon amongst other products upon dry distillation, and those which do not. The first group of umbelliferon yielding samples to which the European commercial Asafœtidas belong is distinguished by the alcoholic tincture being precipitated by acetate of lead and the fluorescence of the sulphuric acid solutions. The second group to which the Bombay kind belongs are not precipitated by acetate of lead, and their sulphuric acid solutions are not fluorescent. The turning of a red colour on exposure to light, and the malachite-green spots produced by nitric acid (first observed by Flückiger) also distinguish the common Asafœtidas from the Indian ; it may also be particularly mentioned that stem-remains are found in some kinds of common Asafœtida, while the Bombay kind always contains slices of roots.

Petroleum-ether, besides extracting the essential oil, extracts a non-volatile substance which greases paper. The extractive matter can be used to distinguish the two kinds of Asafœtida, and also to estimate their worth; Asafœtida of an ordinary commercial quality in tears yields at least 7 % residue to Petroleum-ether, lump at least 5 %. The volatile constituents should not be less than 5 % in tear or 3 % in lump Asafœtida. Good Indian Asafœtida should yield at least 11 % to Petroleum-ether, and this residue should not lose more than 6 % when heated to 120° C. Flückiger has obtained from Hing a reddish essential oil having a specific gravity of 1·02 at 25 C., and deviating 38·8 to the right, when examined in a column of 100 millimetres in length.

Commerce.—Hing is known in the Bombay market as Abushaherí Hing; it arrives in skins which contain about 100 lbs.; latterly some boxes have been received. The quality varies greatly, inferior parcels contain an undue proportion of the root; in Bombay it is often still further adulterated by mixing it with gum Arabic in different proportions, according to the priced article required. To do this the package is broken up and moistened, the gum is then added, and the whole trodden together by men with naked feet upon a mat. When sufficiently mixed, it is sewn up in skins to imitate the original packages. Recently adulteration with sliced potato has been observed. Hing of good quality is worth about Rs. 80 per cwt. in Bombay.

Ferula narthex, *Boiss., Bentl. and Trim., t.* 126.
Scorodosma fœtidum, *Bunge., Bentl. and Trim., t.* 127.
} The gum resin.

Vernacular.—Hingra (*Bomb.*)

History, Uses, &c.—Commercial Asafœtida is collected by the Kákar Pathans, in Western Afghanistan; in May the mature roots begin to send up a flowering stem which is cut off and the juice collected in the manner described by Kœmpfer, who witnessed its collection in the province of Láristán in Persia. There has long been much doubt concerning the species of Ferula which produce commercial Asafœtida in Afghanistan and Persia, but a fresh, flowering specimen of the Asafœtida plant of Western Afghanistan kindly forwarded to me by Dr. Peters shows that, in that country F. narthex is the source of the drug. Dr. Peters' attention was drawn to the subject by seeing the flowering stem offered for sale as a vegetable in the Quetta bazar. Concerning the Láristán plant we are still without exact information. The remarks made respecting the use of Asafœtida by the natives of India under Ferula alliacea are more or less applicable to the present article, which is used by the poorer classes as a substitute for the more expensive Hing. Hingra arrives in Bombay from Persia and Afghanistán. The Persian is produced in the province of Láristán, and is known to Persian merchants as Anghuzeh-i-Lári; it generally arrives in a moist condition, but soon hardens. The latter comes from the country about Herat *viâ* Kandahar, and is generally hard and dry. Very fine samples in tears are not uncommon. The stony Asafœtida described by Pareira is commonly met with in this market; it is simply a mixture of very fluid common Asafœtida with the white sandy soil of the country in which the plant grows; it fetches a very low price, and as far as I can make out, the mixture is made more for convenience of carriage than for the purpose of deception. Besides, when the juice is unusually fluid, it runs out upon the surrounding ground and becomes mixed with the sand.

Description.—The best Hingra occurs in tears or flat pieces, upon the under-surface of which particles of sand often adhere; the external surface is yellowish, but the fresh fracture is of a pearly white, which by exposure to the air becomes bright pink and finally dirty yellow. Inferior samples consist of agglutinated tears, with a certain proportion of moist brown clammy gum-resin filling up the interspaces between them. Sometimes the Asafœtida which comes from Persia is a homogeneous soft white mass like clotted cream; these parcels upon exposure to the air develop an unusually bright pink colour. The drug has a powerful but not purely alliaceous odour, and a bitter acrid taste.

Microscopic structure.—In the root, portions of which may sometimes be obtained from a mass of second sort Asafœtida, there may be seen a perfectly regular arrangement of the zones, contrasting strongly with the root of F. alliacea. It is like that root remarkable for very large laticiferous vessels, but these are distributed symmetrically, the largest occupying the outer radius of the section.

Chemical composition.—The following account is extracted from the Pharmacographia:—" Asafœtida consists of resin, gum and essential oil, in varying proportions, but the resin generally amounting to more than one-half.

" As to the oil we have repeatedly obtained from 6 to 9°/ₒ, by distilling it from common copper stills. It is light yellow, has a repulsive, very pungent odour of Asafœtida, tastes at first mild, then irritating, but does not stimulate like oil of mustard when applied to the skin. It is neutral, but after exposure to the air acquires an acid reaction and different odour; it evolves sulphuretted hydrogen. In the fresh state, the oil is free from oxygen; it begins to boil at 135° to 140° C., but with continued evolution of hydrogen sulphide, so that we did not succeed in preparing it of constant composition, the amount of sulphur varying from 20 to 25 per cent.

" We found it to have a sp. gr. of 0·951 at 25° C., and a strong dextrogyrate power. If one drop of it is allowed to float on water it assumes a fine violet hue by vapours of bromine.

" The essential oil of Asafœtida submitted to fractional distillation yielded us, at 300°, a considerable proportion of a most beautifully blue-coloured oil. By very cautiously oxidizing the crude oil, we obtained a small amount of extremely deliquescent crystals of a sulphonic acid. Sodium or Potassium decomposes the oil with evolution of gas, forming potassium sulphide; the residual oil is found to have the odour of cinnamon.

"The resin of Asafœtida is not wholly soluble in ether or in chloroform, but dissolves with decomposition in warm concentrated nitric acid. It contains a little Ferulaic acid, crystallizing in iridescent needles, soluble in boiling water; it is homologous with eugetic acid.

"Fused with potash, ferulaic acid yields oxalic and carbonic acids, several acids of the fatty series and protocatechuic acid. The purified resin treated in like manner yields resorcin; and by dry distillation, oils of green, blue, violet, or red tint, besides about ¼ per cent. of Umbelliferone, C^9 H^6 O^3."—(Pharmacographia, 2nd Ed., p. 318.)

Commerce.—The imports into Bombay are about 2,500 cwts. annually, from Persia and Afghanistan. Value, Rs. 10 to 20 per Surat maund of 37½ lbs.

Kandaharí Hing.—This substance appears to have been quite unknown in Europe, until I brought it to the notice of Professor Flückiger and the late Mr. Hanbury. I have not as yet been able to obtain authentic specimens of the plant, but for the following reasons I consider it likely that it will prove to be the same as that which produces the officinal drug:—

1. Bellew mentions a very high-priced Asafœtida obtained by wounding the leaf bud of the plant which produces ordinary Asafœtida; our article is generally mixed with numerous leaf buds, which have evidently been cut off by a sharp knife; its price is also much higher than that of any other kind.

2. When examining a number of bales of common Asafœtida from Kandahar, I found some of them to contain particles of the more expensive drug, and a large quantity of what appeared to be gum-resin in a transition stage between the transparency of Kandahar Hing and the opacity of the commercial article.

3. A portion of root found in a bale of Kandahar Hing agreed exactly with a piece obtained from a bale of common Asafœtida.

Kandaharí Hing comes to Bombay in small quantities; it is sewn up in goat skins, forming small oblong bales, with the hair outside. When it first arrives it is in moist flaky pieces and tears, from which a quantity of reddish-yellow oil separates on pressure; the gum-resin also is of a dull reddish-yellow colour, soft, and somewhat elastic, with an odour recalling that of garlic and oil of caraways. By keeping, it gradually hardens and becomes brittle and of a rich red-brown colour; the odour also becomes more purely alliaceous, and approaches to that of the commercial kind. In one instance I have known the drug to arrive in Bombay in a semi-fluid state; this also happens sometimes in the case of common Asafœtida, and is probably due to an exceptionally moist season, which makes the juices of the plant unusually liquid. This kind of Hing is entirely consumed in Bombay by the manufacturers of adulterated Asafœtida, its strong odour and flavour make it especially valuable for this purpose. The average value is Rs. 25 per Surat maund of 37½ lbs.*

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* The names of the Asafœtida plant and its parts met with in Arabic and Persian books are the following:—

The plant.—انگدان Angudán, درخت انگوزه Darakht-i-Anguzeh کولا پر Kúlápar, *Pers.* انجدان Anjudán, *Arab. from the Persian.*

The gum-resin.—انگوزه Angúzeh, صمغ انگدان Samgh-i-angudán, انگژد Anguzd, a compound word from انگدان and ژد gum, *Pers.*, حلتيت Hiltít, *Arab.*

The root.—محروث Mahrúth, *Arab.* بيخ انگدان Bikh-i-angudán, *Pers.*

The seeds.—تخم انگدان Tukm-i-angudán, *Pers.* بزر الانجره Bazr-el-anjareh قريض Karíd, *Arab.*

Vulgar name for Asafœtida انگشت گنده Angusht gandeh or Stink-finger.

پزپز *Pizpaz,* is a term applied in Laristan to cream-like white Asafœtida, from its resemblance to 'pus laudabile,' *Pers.* پز Paz.

کما *Kuma,* is the Persian name for Ferula ovina, *Boiss.*, a plant of which sheep are very fond, and which is used as a potherb.

Ferula galbaniflua, *Boiss., Bentl. and Trim., t.* 128. The gum-resin.

Vernacular.— No Indian names, Jawáshír, Gaoshír, Biríz (*Pers.*) Fruit, Húshí (*Beluch.*)

History, Uses, &c.—Besides the plant which is placed at the head of this article, Boissier makes another species, F. rubricaulis, to grow in Persia. Borszczow, however, regards it as only a variety of F. galbaniflua. He states; though not from personal observation, that its gum-resin, which constitutes Persian galbanum, is collected for commercial purposes round Hamadan. Persian brokers in Bombay state that the galbanum plant is very abundant between Shiráz and Kirmán, and there would seem to be no reason to doubt that this market is supplied from that district. The stems, fruits, and flowers, which often come here mixed with the drug, appear to me to answer to the description of either plant. The old Hindu writers make no mention of galbanum; Ainslie found that the Tamil physicians were unacquainted with it. In many Mahometan works the notices of galbanum appear to have been copied from Greek writers, the synonyms given being generally Barzad and Kinneh. The author of the Makhzan-el-Adwiya, speaking of Barzad, says it is called Kinneh in Arabic, Khalbani in Greek,* and Bireja or Ganda-biroza in Hindí, and is the produce of an umbelliferous plant like that which produces Sagapenum, but he adds, that the drug which he has met with in India under these names is the produce of a tree called Deodar growing in the north of India. His experience accords with that of the present day, the only Ganda-biroza obtainable being the turpentine of Pinus longifolia. In Bombay Persian galbanum is known as Jawáshír; on referring to the Makhzan I find this word explained as an Arabic corruption of the Persian Gaoshír. The author says that it is a fetid gum-resin, and describes its collection from an umbelliferous plant, its appearance, &c., and with regard to its properties informs us that it is attenuant, detergent, antispasmodic and expectorant, and is prescribed in paralytic affections, hysteria, chronic bronchitis and asthma,* also on account of its stimulant action upon the uterus. Externally it is used as a plaster. In short he enumerates the uses to which galbanum is generally applied. It is then clear that the Arabs and Persians have not identified the Persian Gaoshír with the galbanum of Greek writers. To the native practitioners of India galbanum may be said to be an unknown drug, the bulk of what is imported into Bombay being sent to Egypt and Turkey as Jawáshír. It is hardly necessary to add that those writers who have identified Jawáshír with Opoponax can never have seen the latter drug. I have never met with Opoponax in Bombay.

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* Conf. Dios. περι χαλβάνης, iii., 88.

Description.—Jawáshír is a yellow or greenish yellow fluid of the consistence of thick honey, and having an odour between that of Levant galbanum and Sagapenum. It generally arrives mixed with portions of the stem, flowers and fruit of the plant; the root is rarely to be met with. I have never seen this gum-resin quite dry, but in some samples the consistence has been sufficient to enable me to trace the outline of separate tears in the streaky mass. The fragments of the plant found in Jawáshír agree with the botanical characters of F. galbaniflua.

Chemical composition.—For an account of the chemistry of Levant galbanum, which is the ordinary galbanum of commerce, the reader is referred to the Pharmacographia and other standard works on Materia Medica. According to Hirschsohn, good Persian galbanum should yield to petroleum spirit not less than 65 °/₀, consisting of volatile oil and resin, the average yield of Levant galbanum being between 60 and 63 °/₀. The amount of ash in Persian galbanum should not exceed 4 °/₀, being less than the ash of ordinary lump Levant galbanum by 2 °/₀. The best Levant in tears gives the same ash as clean Persian. As a qualitative reaction to distinguish the varieties of galbanum, hydrochloric acid can be used, as it colours the Persian resin yellow-red, passing into red, and the Levant different shades of violet. The petroleum spirit extracts from the Persian sorts give with nitric acid a rose red colour; those from the Levant sorts different shades of violet. Bromine vapour colours the Persian weakly or intensely violet, but the Levant yellow.

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* The Jawashir pill often prescribed in asthma consists of equal parts of Jawashir and Colocynth pulp rubbed up with honey.

The ether-resin from both kinds of galbanum upon boiling with water, gives indications of umbelliferone.

As to the origin of Galbanum, the author believes from its varied behaviour with reagents, the different action of the volatile oils upon polarized light, and the different proportions of volatile oil to the gum-resin, that it is derived from different plants. He also points out that the Levant galbanum occurring in commerce contains no fruit and seldom stalks, but always slices of root, whilst the Persian galbanum always contains fruit and stalks.

Commerce.—Jawáshír is imported from Persia, where it is said to be collected between Shiráz and Kirmán. The imports are irregular; sometimes large quantities arrive. Most of it is re-exported to Egypt and Turkey. Value, Rs. 8 per maund of 37½ lbs.

Dorema Ammoniacum, *Don., Bentl. and Trim., t.* 130. The gum-resin.

Vernacular.—Ushak (*Arab., Pers.,* and *Bomb.*) It has no Indian name.

History, Uses, &c.—Two species of Dorema, D. ammoniacum and D. Aucheri, *Boiss.,* both natives of Persia, are known to produce a gum-resin identical with the commercial article, and it is probable that some of the other species also contribute a portion of the ammoniacum of trade.

Dioscorides speaks of ammoniacum as the juice of a narthex growing about Cyrene in Libya,* and it appears to have derived its name from the temple of Ammon. Pliny derives it from 'Ammos,' sand. Most Greek and Latin writers on medicine mention its use in fumigation, and speak of it as Thus Libycum, ammoniacum thymiana, or ammoniacum suffimen. This kind of ammoniacum has now been ascertained to be the gum-resin of Ferula Tingitana, *Linn.*, which grows in Morocco. It was probably the only kind known in Europe in olden times. (Confer. Pharmacographia, p. 288.) The time when Persian ammoniacum first came into use cannot be exactly fixed.

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* Dios. *περί αμμωνιακοῦ,* iii., 89. It had a reputation as a resolvent, especially in enlargements of the liver and spleen. Scrib. Comp. 128, 131. Persian ammoniacum has a similar reputation in India.

It is not mentioned by the Greeks or Romans. Ibn Sina states that Ushak is the gum of the Tarthúth, and is called Lazák-el-dahab because it is used in gilding. His ammoniacum is doubtless Persian, like that of Abu Masur Mowájik, a Persian physician of the eleventh century, and of Ansári of the middle of the fourteenth century. The latter writer states that the Shirazí name for Ushak is Badrán. In Bokhara the gum-resin bears the name Kandal. According to Bunge and Bienert, the same name, and Kamak, are given to the plant in Persia; whilst Wright gives Weschak, and Dr. Buhse Oschak, as the true names of the plant in that country.

According to Borszczow, D. ammoniacum is called by the Kirghises Bal-kurai or "Honey-cane." (E. Hirschsohn Phar. Zeitschrift für Russland, April 15, 1875, p. 225.) The author of the Makhzan-el-Adwiya says that Ushak is an Arabic corruption of the Persian Ushnah or Ooshah, and that the drug is also called Kalbani, and in Arabic Ushajj, Wushajj, Wushak and Lazák-el-Dahab. He gives the Greek names as Athánikun, Ammoniakun and Parnaksh, the Egyptian as Kinna, Shak and Kalakh, and the Indian as Kandar. Some Persian writers give Tarthúth as the Arabic and Samgh-i-bal-i-shírín as the Persian name. According to the dictionaries, Bal is the Persian for Tarthúth. Baghdádi tells us that Tarthúth is not the same as ammoniacum. In Bombay the current Persian name is Ushak. The Hindu brokers generally call it ammoniacum. Mahometan works on Materia Medica describe the drug as discutient and attenuant; for more particular opinions respecting it the reader may consult the Makhzan-el-Adwiya, article

Ushak. Sanskrit writers do not mention it. Besides the gum-resin, the root of D. ammoniacum is largely imported into Bombay, and is one of the substances used by the Parsees as incense under the name of Boi, a word cognate with Bú, or Bo, fragrance. It is popularly spoken of as a wood. There can be little doubt that the use of this substance as an incense must date from a very remote period, otherwise the modern Parsees would not be at the trouble of importing it into India. Mr. K. R. Cama informs me that the "wood of fragrant trees" is mentioned in the Avesta as a class, and that one wood in particular is named, "Hadhâ Nâeptanām," which would mean translated into Persian, "Hamisheh naft," always moist, *i.e.*, green. He says: "In modern days we identify this wood, most likely mistakenly, with Pomegranate wood." It would appear then, that there is no specific description of Boi in the Avesta, but that it is traditionally understood to be one of the fragrant woods mentioned therein. It is this root which was some years ago exported to Europe as Bombay Sumbul, after having been cut up and impregnated with musk. When old and worm-eaten it becomes of a loose and spongy texture, and might easily be mistaken for Sumbul by a superficial observer.

Description.—Bombay is the chief mart for ammoniacum, and it is here that the original packages which come from the Persian Gulf ports are opened and sorted for the various markets. The bales, generally of matting or coarse canvas, frequently contain all parts of the plant broken up and encrusted with the adherent exudation. In those which I have examined, the portions of the plant answer to the description of the D. ammoniacum, *Don.* Seed in the mature state is separated in large quantities, and I have seen heaps which must have contained a hundredweight or more in the sorting rooms; the seed is given to cattle. It would appear then that the collection takes place after the plant has matured its fruit, and that hardly any attempt is made by the collectors to separate the plant from the gum-resin; the latter exudes from every part, even the fruit is coated with it, and perforated by insects in the same manner as the stem.

Ammoniacum is usually sorted into three qualities—large tears, middle-sized tears, and small; the last kind is often carelessly picked, and contains dirt and other refuse. If the drug is kept in Bombay during the monsoon, the tears get soft and unite into a lump.

The roots vary in size, the largest being three inches in diameter at the crown; they are generally more or less forked; the root bark is thin and papery like that of the Sumbul, but the root itself is compact, and has a resinous section. A small specimen, powdered and exhausted with boiling water, yielded about one ounce of dark-coloured ammoniacum.

Chemical composition.—The following account is extracted from the Pharmacographia:—“Ammoniacum is a mixture of volatile oil with resin and gum. We obtained only $\frac{1}{3}$ per cent. of oil, which we find to be dextrogyrate; we failed in obtaining terpin from it.

“The volatile oil, which is lighter than water, and has the precise odour of the drug, contains, according to our experiments, no sulphur; a similar observation was made by Przeciszewski. Vigier, who obtained the oil to the extent of 1·8 per cent. by distilling the gum-resin with water, asserts that it blackens silver, and that by oxidation with nitric acid, he detected in it sulphuric acid. He states that with hydrochloric acid, the oil acquires a fine violet tint, passing by all shades to black; we failed in obtaining this coloration. By diluting the oil with bisulphide of carbon, and then adding mineral acids, we observed only yellow coloration. The oil diluted with alcohol acquires a red hue with ferric chloride.

“The resin in ammoniacum usually amounts to about 70 per cent. It is separable, according to Przeciszewski, into two substances—the one a resin having acid properties; the other an indifferent resin. He asserts that the indifferent resin when heated yields sulphuretted hydrogen. Our own experiments failed to show the presence of sulphur in the crude drug; and the same negative result has been more recently obtained in some careful experiments by Moss. Water when boiled with the resin acquires a yellow hue and slightly acid reaction;

the liquid assumes an intense red coloration on addition of ferric chloride.

"Ammoniacum yields no umbelliferone; when melted with caustic potash it affords a little resorcin. The mucilaginous matter of the drug consists of a gum readily soluble in water, and a smaller quantity of about ¼ of an insoluble part, no doubt identical with that occurring in Asafœtida and galbanum. The aqueous solution of the gum of ammoniacum is very slightly levogyre." (Confer. Hirschsohn Phar. Zeitscrift für Russland, April 15, 1875, p. 225.)

Commerce.—All the Ammoniacum which reaches Bombay comes from Persia.

Value, about Re. ¼ per lb.

The root is also imported from Persia. Value, Rs. 4 to Rs. 5 per Bombay maund of 28 lbs.

Dorema aureum, *Stocks, Hooker's Jour. of Botany, iv., p.* 149.

The gum-resin of this plant, gathered by Dr. Stocks in Belúchistan, is described as being an opaque cream-coloured substance, closely resembling in taste, smell and general appearance the ammoniacum of commerce. I have made enquiries for it in the Sind bazars, but cannot find that it is anywhere an article of commerce.

Ferula sp. ? yielding Sagapenum. The gum-resin.

Vernacular.—No Indian name. Sagbínaj (*Arab.*), Iskabínah (*Pers.*)

History, Uses, &c.—The history of this drug is involved in obscurity, and up to the present time its botanical source is unknown. From the examination of portions of the plant found in parcels of the drug received in Bombay, it would appear to be the produce of a Ferula of much the same habit as that producing galbanum. Sagapenum was known to the Greeks,* and through them the early Arabic writers probably became acquainted with its medicinal properties. I see no reason to suppose that the ancient Hindus knew the drug, although Kundel is in some books given as the Sanskrit and Hindí name for it. The author of the Makhzan-el-Adwiya gives a sufficiently accurate description of Sagbínaj, and tells us that it is obtained from the district of Mah, near Ispahán. Persian brokers in Bombay inform me that the drug brought to this market is collected in the country between Shiráz and Kirmán. It is necessary to remark that Persian Sagapenum is distinctly different from what is known as Levant Sagapenum. Mahometan physicians consider Sagapenum to be attenuant and resolvent; when combined with purgatives it is thought to exert its resolvent power upon every part of the system, removing noxious humours; they also value it as an anthelmintic and emmenagogue. For a full account of the diseases in which it is prescribed, I must refer the reader to the Makhzan-el-Adwiya, article Sagbínaj. A sagapenum pill is often prescribed in flatulent dyspepsia; it contains equal parts of Aloes, Sagapenum, Bdellium and Agaric. Two to three dirhems are to be taken with warm water.

Description.—Sagapenum generally arrives in Bombay in masses weighing from four to ten pounds, tied up in coarse cloth, but occasionally parcels consisting of fine, dry, separate tears are seen.

The masses are made up principally of tears, which being mixed with a proportion of soft gum-resin, adhere together, forming a brownish-yellow cake; when fresh some of the tears have a greenish tinge, and are more or less opaque, but by keeping they all become brownish-yellow and translucent. The dry tears are always of a brownish-yellow.

The odour is distinctly alliaceous, but in other respects is much like that of Persian Galbanum. The fruit found in Sagapenum are larger than those found in Galbanum.

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* Dios. iii., 86 *περὶ σάγαπηνου.*

Chemical composition.—Persian Sagapenum and Persian Galbanum closely resemble each other, and the same may be said of Levant Sapagenum and Levant Galbanum. As characters for distinguishing Sagapenum from Galbanum may be used—(1*st*), the presence of sulphur in Sagapenum; and (2*nd*), their behaviour towards petroleum spirit, Persian Sagapenum yielding to it 2 to 5 °/° and Levant 6 to 12 °/° of resin, whilst the resinous residue from Persian Galbanum amounts at the most to 0·2 to 0·3 °/°, and that from Levant Galbanum to 1 per cent. (Confer. Hirschsohn Phar. Zeitschrift für Russland, April 15, 1875, p. 225.)

Commerce.—The quantity annually imported into Bombay varies greatly, most of it goes to London. It is seldom to be obtained in the retail shops. Value, Re. ½ to Re. ¾ per lb.

Tordylium Secacul, *Mill. Dict. Ic., t.* 268.

Syn.—Pastinaca secacul, *Russel Alepp., p.* 157.

Vernacular.—Shakakul-i-Misri, Egyptian Shakákul.

Shakákul is a Persian word, which is explained by the Burhán as meaning the Wild Carrot; the best kind is described as thick, heavy, and yellowish; women are said to miscarry if they touch it.* Shakákul is mentioned by Ibn Sína. The adjective Misri (Egyptian) is added to distinguish the drug from the Shakákul of India, which is also called Satáli, Saváli, Dudháli and Satawri. (See Asparagus.) The Shakákul-i-Misri sold in Bombay is a root of the shape and size of a small carrot, with a conical leaf-bud rising from the crown; externally it is wrinkled and longitudinally furrowed, and is of a light brown colour; internally it is white, starchy and friable; taste amylaceous and sweetish. The hakíms consider it to be tonic and aphrodisiac. Another kind of Shakákul is occasionally sold in Bombay; it is a shrivelled rhizome of a light brown colour, marked with transverse scars like Galangal, the taste is sweet and gummy; when soaked in water it swells greatly, becomes quite soft, and is easily cut like preserved ginger. The drug comes from China, and is probably the root of Sium ninsi, *L.*

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* Compare with Dioscorides περὶ δαύκου.

CORNACEÆ.

Alangium Lamarckii, *Thwaites, Wight Ic., t.* 194; *Ill., t.* 96; *Rheede Hort. Mal. iv., tt.* 17, 26. The root bark.

Syn.—A. decapetalum, hexapetalum, and tomentosum, *Lam.*

Vernacular.—Dhera, Akola, Ankúl (*Hind.* and *Bomb.*), Azhinji-maram (*Tam.*), Dhalákura (*Beng.*)

Description, Uses, &c.—The root-bark of this tree, mentioned in Sanskrit works as Ankota, has a reputation in leprosy and skin diseases. Mr. Moidín Sheriff has drawn attention to its emetic action in his Supplement to the Pharmacopœia of India. He says:—"It has proved itself an efficient and safe emetic in doses of fifty grains; in smaller doses it is nauseant and febrifuge. The bark is very bitter, and its repute in skin diseases is not without foundation. If it is continued for a sufficient period its influence over them is greater than that of Calotropis gigantea." Mr. Moídín Sheriff, in a further report upon this drug (1883), states:—"It is a good substitute for Ipecacuanha, and proves useful in all diseases in which the latter is indicated, except dysentery. As a diaphoretic and antipyretic it has been found useful in relieving pyrexia. Dose as a nauseant, diuretic and febrifuge 6 to 10 grains of the root bark, as an alterative 2 to 5 grains; it is given in leprosy and syphilis; the natives consider it to be alexiteric, especially in cases of bites from rabid animals."

The tree is not uncommon in the Concan and Deccan; it may be seen at Elephanta, near Bombay, also at Tanna. I have not seen it used medicinally.

Dr. S. Arjun (Bomb. Drugs, p. 70,) states that the leaves are used as a poultice to relieve rheumatic pains.

Pavetta Indica, *Linn., Wight Ic., t.* 148; *Rheede Hort. Mal. v.*, 19, 20, *t.* 10. The root.

Vernacular.—Kúkúra-chúra (*Beng.*), Pápat (*Bomb.*), Pavuttay-vayr (*Tam.*), Kankra (*Hind.*)

History, Uses, &c.—Roxburgh does not notice the medicinal properties of this plant. Ainslie says:—"This is a bitter but not unpleasant tasted root, possessing at the same time aperient qualities, and is one of those medicines commonly prescribed by the native doctors in visceral obstructions; given in powder to children, the dose is about a drachm or more. The shrub in Sanskrit is called Pappána. It is the malleamothe of Rheede." In this part of India the shrub is very common, and has a reputation as a bitter and aperient, but no exact observations of its action appear to have been made.

Description.—The root is crooked, from 1 inch to ¼ inch in diameter. Its bark is grey, with a light brown papery epidermis, and seems to be the most active part. It has a bitter and subacrid taste. A section placed under the miscroscope shows large laticiferous vessels, containing a greenish latex, and a parenchymatous structure containing many small starch granules. It is not an article of commerce.

Pæderia fœtida, *Linn., Gärt. f. Fruct. iii., t.* 195; *Griff. Ic. Pl. Asiat., t.* 479, *f.* 3.

Vernacular.—Gandháli (*Hind.*), Gandhabháduli (*Beng.*), Prasáram (*Bomb.*), Hiranwel (*Mar.*)

History, Uses, &c.—An article of the Hindu Materia Medica in repute as a remedy for rheumatism. The Sanskrit name is Prasárani. I have not seen it noticed by Mahometan writers. It is the P. fœtida of Willdenow (Spec. I., 1219), the Somaráji of the Asiatic Researches (IV., 261), the Convolvulus fœtidus of Rumphius (Amb. V. 436, t. 160), and the Apocynum fœtidum of Burmannus (Ind., p. 71). The plant is found in most parts of India and all through the Malayan Archipelago, extending from the Mauritius northward to China and Japan; in Assam it is called 'Bedolí Sutta,' and in China Jung-gala; it has been lately brought to notice as a fibre-yielding plant; Roxburgh says that the Hindus use the root as an emetic. As a specific in rheumatism used both internally and externally it is best known in Hindu medicine. Bháva Misra prescribes an electuary (Prasárani leha), which is made by boiling down a strong decoction of the plant with treacle to the consistence of a thick syrup, and then adding ginger, pepper and Plumbago root. In Chakradatta the method of preparing a liniment (Kubja prásáran taila) will be found. (Confer. Dutt's Hindu Materia Medica, p. 179.) In the Bombay Presidency the plant is found in the Southern Concan.

Description.—Stem ligneous, twining, young parts round, smooth; leaves opposite, long petioled, oblong-cordate, pretty smooth, entire; stipules broad-cordate; panicles axillary and terminal; flowers numerous, of a deep pink colour; bracts ovate; berry dry, compressed, smooth, with five lines on each side, one-celled, two-seeded; seed compressed, smooth, with a membranous ring all round. (For fig. see Baillon's Nat. Hist., Vol. VII., p. 274.) All parts of the plant give off a most offensive odour when bruised; it is not sold in the shops, but may sometimes be obtained from travelling herbalists.

Morinda citrifolia, *Linn., var. bracteata, Wight Ill., t.* 126.

„ **tomentosa,** *Heyne.* The root and leaves.

Vernacular.—M. citrifolia, Ál (*Hind.*), Ál, Bártondi, Nágakuda (*Bomb.*), Núna-maram (*Tam.*), Ach (*Beng.*)

M. tomentosa, Ása (*Bomb.*)

History, Uses, &c.—The roots of M. citrifolia, *Linn.* (M. tinctoria, *Roxb.*), as well as those of one or more other species of Morinda have long been used as a red dye and also as a medicine by the natives of India. Achchhuka is the Sanskrit name for M. citrifolia. Ainslie, speaking of Morinda umbellata, gives the following account of the genus :—" There are two varieties of this tree in India ; our present article is the lesser, and would appear to be the Bancudoo lakki of the Malays. The lanceolate-ovate leaves of it, in conjunction with certain aromatics, the Tamool doctors use in decoction, in cases of diarrhœa and dysentery, in the quantity of half a tea-cupful twice daily. The Noona is the Cay-nge-ba of the Cochin-Chinese, and the Bancuda angustifolia of Rumphius (Amb. III., p. 157, t. 98), but Willdenow seems inclined to consider it rather as a variety of the M. citrifolia than a distinct species. Its root (as well as that of the M. citrifolia), the Cay-nhan of Cochin-Chinese and Ahugaha of the Cingalese (and which by the way Tamools also call Noona-maram and the Mysoreans Muddi) is used in many parts of India as a red dye. The species citrifolia the Cochin-Chinese place amongst their medicinal plants, believing the fruit to be deobstruent and emmenagogue." In Bombay the leaves are used as a healing application to wounds and ulcers, and are administered internally as a tonic and febrifuge.

Description.—M. citrifolia is distinguished by its oval, oblong, shining leaves, and M. tomentosa by the young branches and leaves being tomentose. Both have white flowers with a long infundibuliform corolla, and in both the berries are fused into an oblong fleshy fruit. That of M. citrifolia is the largest, being often more than three inches in length ; it is pale green, smooth, in the pulp are embedded a number of black seeds somewhat like apple-pips. The leaves are very bitter.

Chemical composition.—Anderson has obtained from the root-bark of M. citrifolia by exhausting it with alcohol a crystalline principle, *Morindine*, $C^{28} H^{30} O^{15}$, to the presence of which the dyeing properties of the plant are due ; after repeated crystallizations from dilute alcohol Morindine forms slender yellow needles of a satiny lustre, soluble in boiling water, which on cooling deposits it in gelatinous flakes. Alkalies form with Morindine orange-red solutions. Heated in a closed vessel

Morindine melts, boils, and emits orange vapours, which on condensation form long orange-yellow needles of *Morindone.* Rochleder (Jahresb. f. 1851, p. 548), considers Morindine to be identical with the ruberithric acid which he has extracted from madder, and Morindone to be identical with alizarin, but Morindine differs from the ruberithric acid in being insoluble in ether and in its behaviour with alkalies; like ruberithric acid it is a glucoside. (Wurtz, Dict. de Chim., t. ii., p. 454; Edin. Phil. Trans., xvi., p. 434.)

Oldenlandia corymbosa, *Linn., Rheede Hort. Mal. x., t.* 38. The plant.

Vernacular.—Daman-papar (*Hind.*), Popato, Kázuri (*Goa*), Khetpapra (*Beng.*), Paripát (*Mar.*)

History, Uses, &c.—This plant, called in Sanskrit Kshetraparpati and Parpata, is the Oldenlandia biflora of Roxburgh and the O. herbacea, *D. C.* It is frequently mentioned in Sanskrit medicinal works, and is considered a cooling medicine of importance in the treatment of fevers supposed to be caused by deranged air and bile, that is, remittent fever with gastric irritability and nervous depression. The entire plant is prescribed in decoction, and is combined with aromatics. When in Goa I found it in all the drug-shops, and was told that it is much used in that part of the country combined with Adiantum lunulatum and Hydrocotyle asiatica as an alterative in low forms of fever. I have never seen it in the Bombay shops. In the Concan the juice is applied in burning of the palms of the hands and soles of the feet from fever; in burning at the pit of the stomach the juice is given internally with a little milk and sugar (dose 1 tolá of the juice obtained by pounding the plant with water). The decoction is given in remittent fever and is also applied to the surface of the body; it is also given internally to cure heat eruptions.

Description.—A small plant common on cultivated ground, erect, about one foot high, dichotomous, glabrous; stem acutely four-angled; leaves linear-lanceolate; pedicles one-flowered, axillary, solitary, or in pairs in the opposite or alternate axils, shorter than the leaves; capsule roundish-ovate, crustaceous, opening across the apex; root small and fibrous. The plant turns black when dried. It is very common in Náchní (Eleusine coracana) fields in the Goa territory.

Oldenlandia umbellata, *Linn.*, *Roxb. Cor. Pl. t.* 3. Chay-root or Indian madder, *Vern.* Chirval (*Hind.*), Imbural (*Tam.*), occurs in the Bombay Presidency, but does not appear to be used medicinally. Ainslie says that "the small narrow, pale green leaves of this low growing plant the native doctors consider as expectorant, and prescribe them accordingly; of the virtues of the root in poisonous bites, colds and cutaneous disorders, as mentioned by Miller in his Dictionary, I know nothing. When dried and powdered the leaves are sometimes mixed with flour and made into cakes, which are eaten by such as suffer from consumptive or asthmatic affections. The dose of the decoction of the leaves is about an ounce twice daily." The root is long and slender, with a few lateral fibres, and of an orange colour. It is best known as a dyeing material. (Confer. Drury, Useful Plants of India, 2nd Ed., p. 241.)

Hymenodictyon excelsum, *Wall.*, *Wight Ic.*, *t.* 79. The bark.

Vernacular.—Bhaulan (*Hind.*), Kálá Karwah (*Bomb.*), Bandárú (*Tel.*), Sagapu (*Tam.*)

History, Uses, &c.—Roxburgh informs us that the inner coat of the bark possesses the bitterness and astringency of Peruvian bark. The H. excelsum is his Cinchona excelsa. Ainslie quotes Roxburgh, and tells us that the bark is used by tanners, and also as a medicine by the Hindus in cases requiring astringents. H. excelsum yields a bitter bark in common use among the natives as a tonic and febrifuge, and which has been tried in the Calcutta Medical College Hospital by O'Shaughnessy, and found to be most valuable. In 1870, Broughton examined the fresh bark of one of the Hymenodictyons, and found that the bitter taste was due to the existence of *æsculin*, and that the bark when dry was almost tasteless owing to the transformation of that substance into *æsculetin*, the decomposition having been induced by contact with decaying organic matter. The fact here mentioned that the bark when dry lost its bitterness leads me to suppose that it was not that of H. excelsum but of H. obovatum, the dry bark of the former tree being extremely bitter.

Description.—The bark of H. excelsum is very bitter, and may be distinguished from that of H. obovatum by its red colour and bitterness. The minute structure resembles that of the Cinchonas, but the bundles of liber cells are larger, the spiral and laticiferous vessels also are more numerous, the latter being very large, and exuding when cut a waxy latex. Many of the cells are filled with a red colouring matter as in Cinchona bark; and there is a continuous ring of liber cells near the junction of the bark with the wood; the liber cells exhibit a large central cavity. The bark examined was from branches about one inch in diameter.

Chemical composition.—From an examination of the bark by W. A. H. Naylor, it appears that the bitter principle is not the glucoside æsculin, or its decomposition product, æsculetin, but an alkaloidal substance. That as such it is allied to quinoidine, berberine and paricine. From quinoidine it differs in being optically inactive, and from its double compound containing relatively less platinum. From berberine it differs in that it contains a higher percentage of carbon, while its double compound also yields a relatively larger amount of platinum. From paricine it differs only in the percentage of hydrogen it gives. Mr. Naylor considers it to be a new alkaloid having a composition corresponding to the empirical formula C^{24} H^{40} N^{3}, and therefore an addition to the small class of bases devoid of oxygen. Besides "*Hymenodictyonine,*" which is the name given to the new alkaloid, Mr. Naylor has separated a bitter neutral principle, represented by the formula C^{22} H^{43} O^{10}, which he thinks may possibly be a decomposition product of a glucoside (1883).

Mr. Naylor has since succeeded in obtaining Hymenodictyonine in a crystalline form, by extremely slow evaporation of its ethereal solution. When placed in contact with cold sulphuric acid, the solution by transmitted light assumed a lemon-yellow colour, passing to a wine red, and ultimately to a deep claret; by reflected light it presented a bronze appearance. It was found difficult to burn off the carbon, but combustion with chromate of lead yielded figures which agree with those deduced from analysis of the platinum salt, estimation of the chlorine in the double salt, and in the hydrochlorate of the alkaloid and the composition of its diethyl-iodide. The alkaloid proves to be dibasic with the formula C^{23} H^{40} N^{2}, and it is apparently a tertiary diamine. Its chemical properties display a close analogy with those of nicotine.

Randia uliginosa, *D. C., Wight Ic., t.* 397; *Roxb. Cor. Pl., t.* 135.

Vern.—Pendari. The unripe fruit roasted in wood ashes is used as a remedy in diarrhœa and dysentery, the central portion consisting of the stone and seeds being rejected; it is astringent, and is also cooked as a vegetable in the Concan. The fruit is the size of a small lemon, smooth and yellow when ripe; in structure it closely resembles that of R. dumetorum.

Randia dumetorum, *Lam. Ill., t.* 156, *f.* 4; *Wight Ic., t.* 580; *Roxb. Cor. Pl., t.* 136. The fruit.

Vernacular.—Mainphal (*Hind.*), Gelaphal (*Bomb.*), Marukkallān-kay (*Tam.*), Menphal (*Beng.*), Mindhal (*Guz.*).

History, Uses, &c.—Mainphal is described by Sanskrit writers under the name of Madana as the best or safest of emetics; one ripe fruit is said to be a sufficient dose; emesis is generally promoted by a drink containing bitters and aromatics. It is indispensable at the marriage ceremonies of the Vaisya caste, being tied upon the wrists of both bride and bridegroom along with the fruit of Helicteres Isora. Mahometan writers tell us that it is found in Arabia as well as India, and is called by the Arabs Jouz-el-kai; they describe it as an emetic which expels bile and phlegm, at the same time acting as an aperient; it should be administered in combination with aromatics and honey. Ainslie says:—"The Vytians consider it amongst their best emetics, and prescribe it in the quantity of about one pagoda weight. It is given commonly in the form of powder, the whole nut, seeds included, being powdered." An infusion of the bark of the root is administered to nauseate in bowel complaints. Roxburgh in his Coromandel Plants observes that the nut bruised and thrown into pools where there are fish intoxicates them, in the same way that the Cocculus Indicus does. This practise may be observed in the Concan where the fruit is well known as a fish-poison, and is also mixed with corn to preserve it from insects. Mr. Moidín Sheriff, in his Supplement to the Pharmacopœia of India, says:—" It is certainly not a good emetic if used as is generally done by powdering the whole nut. The thick shell and the numerous hard seeds are not emetic at all; indeed if anything they are slightly irritant; only the dry pulp or mucus, which is the least part of the nut, possesses emetic and nauseant properties.

" The contents of two to three nuts are generally a sufficient dose; they should be bruised, macerated for ten or fifteen minutes in three to four ounces of water, rubbed and strained through cloth. The draught is now ready for use, and produces nausea and vomiting in about ten minutes; emesis should be promoted by the administration of warm water. The ejected matter contains a large quantity of frothy mucus." Mr. Sheriff has found the drug a good substitute for Ipecacuanha in dysentery. He recommends the powdered pulp as the most convenient form for administration. Dose, 40 grains as an emetic; 15 to 30 grains in dysentery, according to the severity of the disease. The bark of the tree is astringent and is sold by herbalists under the name of Rohida; it must not be confounded with Rakta Rohida, the bark of Rhamnus Wightii. In colic the fruit is rubbed to a paste with rice water and applied over the navel.

Description.—The dried fruit is about the size of a crab apple, globular or oval, reddish brown, crowned with the rim of the calyx. It consists of a pericarp and shell, which contains the seeds embedded in pulp. The shell is hard and thick, 2-celled, the dividing septum being thin and membranous. The pulp is grey, and has a nauseous taste and smell. The seeds are small and oblong, about 1½ lines in length, slightly flattened, very hard and of a brown colour. The average weight of the fruit is about 60 grains, of the pulp separated from the seeds 15 grains.

Microscopic structure.—The greyish pulp surrounding the seeds is composed of large oval cells containing a little granular matter. The pulp of the pericarp is remarkable for numerous large reddish-brown stony cells. The epidermis is formed of tesselated cells of irregular size and shape. The albumen of the seeds is horny and translucent.

Commerce.—The dried fruit is sold for Rs. 5 per Surat maund of 37½ lbs.

Spermacoce hispida, *Linn.*, *Burm. Thes. Zeylan.*, *t.* 20, *f.* 3; *Rheede Hort. Mal. ix.*, *t.* 76.

Vernacular.—Madanaghanti. The root possesses properties similar to Sarsaparilla. It is used as an alterative, and is generally prescribed in the form of a decoction. (Ainslie.) In the Concan it is eaten along with other herbs as a vegetable under the name of Ghánta-chi-bají.

Description.—Herbaceous, diffuse, hairy or scabrous; leaves from obovate oblong to roundish; bristles of the stipules longer than the hirsute sheath; flowers few, axillary sessile, white, tube of the corolla wide; capsule 2-seeded. A common weed. (*Bombay Flora.*)

Anthocephalus Cadamba, *Miq., Rheede Hort. Mal. iii., t.* 33.

Syn.—Nauclea Cadamba.

Vernacular.—Kadamba, Nhyu. The holiest of Indian trees, common near villages and temples in the Concan. The bark is considered to be tonic and febrifuge. In the Concan the fresh juice of the bark is applied to the heads of infants when the fontanelle sinks, and a small quantity mixed with cummin and sugar is given internally. In inflammation of the eyes the bark-juice with equal quantities of limejuice, opium and alum is applied round the orbit. The juice of Nauclea cordifolia (*Vern.*—Héd) is used to kill worms in sores. The so-called *naucleic acid*, the astringent principle of the plant is, according to De Vrij, identical with *kinovin.*

Canthium parviflorum, *Lam.* Leaves and root.

Vernacular.—Kírni (*Bomb.*), Karai-cheddi (*Tam.*)

This is a small thorny shrub, common in the Southern Mahratta Country, where the fruit and leaves are eaten; it is noticed by Ainslie as having medicinal properties. He says:—"A decoction of the edible leaves, as well as root of this plant, is prescribed in certain stages of flux, and the last is supposed to have anthelmintic qualities, though neither have much sensible taste or smell." (Mat. Med. II., 63.) The leaves are ovate and glabrous, often fascicled on the young shoots; the drupe is obovate, slightly emarginate, compressed, furrowed on each side, reddish-brown when ripe, and about the size of a small marble; it is sweet, and contains two seeds.

Ixora coccinea, *Linn., Wight Ic., t.* 153; *Bot. Reg., t.* 513 *and* 154.

Syn.—I. Banduca, *Roxb.*

Vernacular.—Pankul (*Mar.*)

A very common undershrub in the Concan, often cultivated in gardens, where pink and yellow varieties of it may be seen; the wild plant has cymes of scarlet flowers; it has been named "the flame of the woods." In dysentery 2 tolás of the flowers, fried in ghi (melted butter) are rubbed down with 4 gunjás each of Cummin and Nágkesar, and made into a bolus with butter and sugar-candy and administered twice a day.

Gardenia lucida, *Roxb., Wight Ic., t.* 575.

„ **gummifera,** *Linn., f., Thunb. diss. Gard., t.* 2, *f.* 3.

The resin.

Vernacular.—Dikamâli (*Hind., Bomb.,* and *Tam.*).

History, Uses, &c.—This remarkable resin is produced in great abundance in Western India, but I have not met with any mention of it in Sanskrit works on Materia Medica. The Mahometans value it as an internal remedy in dyspepsia attended with flatulence. In veterinary practise it is much used to keep flies from sores, and some European physicians have used it to expel round worms with success. Those who have written upon Indian drugs say little about this resin, although it is an article of commerce, and can always be obtained in quantity. Recently it has attracted attention in Europe, and has been examined by Stenhouse, Groves and Flückiger. In the Concan the root of G. florida, *Linn.,* rubbed into a paste with water is applied to the top of the head as a remedy for headache during pregnancy; it is also given internally in hysteria, alone, or combined with Bhárangi.

Description.—Commercial Dikámali occurs in the form of irregular earthy-looking masses, of a dull olive green colour, consisting of the resin, more or less mixed with bark, sticks, and the leaf-buds of the plant. The odour is peculiar and offensive, like that of cat's urine. The pure resin carefully separated from the leaf-buds is transparent and of a bright golden yellow; it dissolves rapidly in rectified spirit, forming a solution of the colour of pale sherry, which when poured into water forms a delicate primrose-coloured emulsion. This after standing for 24 hours deposits a portion of the resin in an opaque condition, and of the colour of precipitated sulphur, but not in sufficient quantity to visibly affect the colour or opacity of the emulsion.

Chemical composition.—Dikamáli contains two resins, one soft and of a greenish colour, the other crystalline and of a golden yellow. The latter was discovered by Stenhouse some twenty years ago. (Phil. Trans. 1856, CXLVI., 155, and Ann. Chem. Pharm. XCVIII., 316), but the amount of gardenin obtained at that time was insufficient for a satisfactory analysis. About three years ago Stenhouse and Groves operating with a larger quantity of the resin found that the best method of obtaining the crude gardenin was to boil the resin with alcohol, filter the solution to separate the insoluble residue, consisting chiefly of small fragments of bark and wood, and allow it to cool. It then deposited almost the whole of the gardenin in slender pale yellow needles, which were collected and washed with cold spirit, to free them from the amorphous greenish yellow resin, which forms by far the larger portion of Dikamáli gum. These needles however, even after several crystallizations from alcohol, were found to be still impure, being contaminated with a colourless substance of low-melting point, somewhat resembling a fat in appearance. After repeated trials in various ways, it was found that this impurity might be removed by means of light petroleum. A boiling saturated solution of the gardenin in alcohol was allowed to cool, and the almost pasty mass of crystals was agitated with light petroleum at a temperature of about 30°, the clear liquid poured off, and the residue again agitated with petroleum, repeating the operation several times. The gardenin was finally purified by alternate crystallization from hot benzine in which it is readily soluble, and from alcohol.

When pure, gardenin forms brilliant deep yellow crystals, which melt at 163° to 164°. Dried at 100°, and burnt in a current of oxygen, it gave the following results :—

I. 0·249 gram. of substance gave 0·567 gram. carbonic anhydride, and 0·119 gram. of water.

II. 0·202 gram. of substance gave 0·457 gram. carbonic anhydride, and 0·102 gram. of water

		Theory	I.	II.	Mean.	Flückiger.
C_5	60	61·86	62·12	61·70	61·91	59·47
H_5	 5	5·16	5·31	5·60	5·45	6·71
O_2	32	32·98	......	......	......	......
	97	100·00				

Flückiger's numbers do not agree with these, but as the specimen he analysed had merely been purified by repeated crystallization from spirit, it is not impossible that it was contaminated with traces of the colourless fatty substance mentioned above. This is rendered very probable by the much lower melting point (155°) which he obtained. It was stated in the earlier paper (Stenhouse *loc. cit.*), that when gardenin is digested with concentrated nitric acid, it is rapidly decomposed, picric acid, but no oxalic acid being produced. On repeating the experiment, however, this statement was found to be incorrect; gardenin when boiled with nitric acid, dissolves with evolution of nitrous fumes, forming a yellow solution, which on evaporation leaves a yellowish residue; this, however, on careful examination, proved to be quite free from trinitrophenol. It was noticed in making this experiment, that at the moment the gardenin came in contact with the nitric acid, it assumed a brilliant crimson colour before dissolving. The attempts made to isolate the red substance thus formed were ultimately successful; one part of gardenin was dissolved in about thirty times its weight of boiling glacial acetic acid, and after being rapidly cooled two parts of nitric acid of sp. gr. 1·45 were added to the clear solution. In a few seconds hair-like crimson needles began to form, very different in appearance from gardenin. At the expiration of five minutes, the mixture, which was kept cold, had solidified to a pulp of needles. It was then mixed with about 150 parts of cold water, and the gelatinous precipitate collected after it had stood a few minutes. The pasty red mass, after being well washed, was pressed into a cake and dried. Gardenin yields nearly 90 °/ₒ of its weight of this substance, which is insoluble in water and dilute acids, but readily soluble in alkaline solutions, and reprecipitated on the addition of an acid. It has been provisionally named gardenic acid. It is free from nitrogen, and after being purified by boiling with spirit, in which it is but very slightly soluble, and crystallization from glacial acetic acid, it was found to melt at about 236°. (Phar. Jour. and Trans., July 21st, 1877.)

Commerce.—Dikamáli is collected by hand, the leaf bud with the drop of resin attached to it being broken off. It is sometimes made into circular cakes of about a pound weight; at other times it occurs in large irregular masses, often very impure. Value, Rs. 3-12 per maund of 37½ lbs.

Mussænda frondosa, *Linn., Rheede Hort. Mal. ii., t.* 18; *Burm. Zey., t.* 76.

Vernacular.—Shivardole (*Mar.*) A shrub which bears deep golden-coloured flowers in the rains; it is easily known by its large white calycine leaves. In the Concan ½ a tolá of the root is given with cow's urine in white leprosy. (Pándú-rog.) In jaundice 2 tolás of the white leaves are given in milk.

Uncaria Gambier, *Roxb., Bentl. and Trim.,* 139. Gambier, an extract of the leaves.

Vernacular.—Chinai Katha (*Bomb.*)

History, Uses, &c.—We meet with no account of this substance in Hindu or Mahometan works on Materia Medica. Ainslie mentions the drug, but he appears to have been very imperfectly acquainted with it, as in his first volume he describes the different kinds of catechu found in Southern India without noticing Gambier. (Confer. Materia Indica, Vol. II., p. 105). Flückiger and Hanbury in their Pharmacographia remark that:—"If we may credit Rumphius, it would seem that the important manufacture of Gambier had no existence at the commencement of the last century. As to 'Gutta Gambier,' his statements are scarcely in accord with those of more recent writers. We may, however, remark that that name is very like the Tamil Katta Kámbu, signifying catechu, which drug is sometimes made into little round cakes, and was certainly a large export from India to Malacca and China as early as the 16th century. That Gambier was unknown to Europeans long after the time of Rumphius, is evident from other facts. Stevens, a merchant of Bombay, in his *Compleat Guide to the East India Trade*, published in 1766, quotes the prices of goods at Malacca, but makes no allusion to Gambier. Nor is there any reference to it in Savary's Dictionnaire de Commerce (Edn. of 1750), in which Malacca is mentioned as the great *entrepôt* of the trade of India with that of China and Japan. The first account of Gambier known to us, was communicated to the Batavian Society of Arts and Sciences in 1780, by a Dutch trader named Couperus. This person narrates how the plant was introduced into Malacca from Pontjan in 1758, and how Gambier is made from its leaves; and names several sorts of the drug and their prices. In 1807 a description of 'the drug called Gutta Gambier,' and of the tree from which it is made, was presented to the Linnean Society of London by William Hunter." (Pharmacographia, p. 299.) A good description of the manufacture of Gambier will be found in the Pharmacographia. The process consists in boiling the leaves and evaporating the liquor until it crystallizes.

Description.—Gambier is an earthy-looking substance of light brown hue, consisting of cubes about an inch each side, more or less agglutinated, or it is in the form of entirely compact masses. The cubes are externally dark reddish brown and compact, internally of a pale cinnamon hue, dry, porous, friable, devoid of odour, but with a bitterish astringent taste, becoming subsequently sweetish.

Under the microscope the cubes of Gambier are seen to consist of very small acicular crystals. (Pharmacographia, p. 301.) Gambier is also imported into Bombay in the form of small lozenges which are known as *Chinai-katha* (Chinese catechu).

Chemical composition.—In chemical composition Gambier agrees with Kutch. (*Vide* Acacia Catechu.)

Commerce.—Gambier is imported into Bombay from Singapore in large baskets. The exports of Kutch and Gambier from India are more than 300,000 cwts. annually.

Value, Rs. 4 to Rs. 6 per Surat maund of 37½ lbs.

Rubia cordifolia, *Linn., Wight Ic., t.* 187; *Dene in Jacq. Voy. Bot.* 84, *t.* 92. The root.

Vernacular.—Majith, Manjít (*Hind., Bomb.,* and *Beng.*), Manjitti, Shevelli (*Tam*).

History, Uses, &c.—Madder is used in Hindu medicine as a colouring agent: medicated oils are boiled with Madder to give them colour. It is also a useful external astringent, and is applied to inflamed parts, ulcers, fractures, &c. Chakradatta recommends Madder rubbed with honey as an application to the brown spots of pityriasis versicolor. The Sanskrit name for Madder is Manjishtha. Under the names of Fuvvah and Rúnás, Arabic and Persian writers treat of Madder, probably the produce of R. tinctorium* (as the roots which come from Afghanistan appear to be identical with those of the European species). They do not, however, make any distinction between the species, but simply mention a wild and a cultivated variety. The Mahometans consider the drug to be deobstruent and prescribe it in paralytic affections, jaundice, obstructions in the urinary passages and amenorrhœa. They mention the fruit as useful in hepatic obstruction, and a paste made from the roots with honey, as a good application to freckles and other discolorations of the skin. The whole plant is reputed to be alexipharmic; it is also hung up in houses to avert the evil eye, and tied to the necks of animals with the same object.*

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* The author of the Makhzan gives Rubia as the European, Dúzarlús as the Greek, and Albísam as the Latin name of Madder.

Ainslie observes that the hakíms are in the habit of prescribing an infusion of Madder root as a grateful and deobstruent drink in cases of scanty lochial discharge after lying-in. (Materia Indica II., p. 182.) In another notice of the article (*Op. cit.* I., p. 202), he remarks that it would appear to be chiefly produced in Cachar, and the root is in great demand in the adjacent countries, for dyeing their coarse cloths and stuffs red; the Nepalese are in the habit of bartering it for rock salt and borax. Kinnier and Tavernier notice the abundance of Madder in Persia and Makran. Dr. G. Playfair, in a note appended to his translation of the Talíf-i-sharífí (p. 150), states that if taken to the extent of about 3 drachms several times daily, it powerfully affects the nervous system, inducing temporary delirium, &c., with evident determination to the uterine system. The plant is common on the higher ghauts in the Bombay Presidency, but the Bombay market draws its supplies chiefly from Khelat through Sind. The imported article fetches a higher price than that grown in India.

Description.—Madder root consists of a short stock, from which numerous cylindrical roots about the size of a quill diverge; these are covered by a thin brownish suber which peels off in flakes, disclosing a red-brown bark marked by longitudinal furrows. The taste is sweetish at first, afterwards acrid and bitter.

Microscopic structure.—A transverse section shows the suber, within which is a parenchyme composed of tangentially extended cells, which are arranged in radiating lines and gradually decrease in size until they become almost square, where they join the cambium layer. These cells contain granular colouring matter, and a few crystals of oxalate of lime.

The wood is provided with numerous and large vessels.

Chemical composition.—According to Bucholz, the constituents of Madder are as follows:—Resinous red colouring matter 1·2, extractive ditto 39·0, reddish brown substance soluble in alcohol 1·9, pungent extractive 0·6, gummy matter 9·0, woody fibre 22·5, matter soluble in potash 4·6, salts of lime with colouring matter 1·8, water 12·0, loss 7·4.

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* Compare with Dioscorides iii., 151. *περὶ ερυθροδάνου*, and Pliny 19, 3 and 24, 11, where R. tinctorium is mentioned under the name of Rubia.

The medical action of Madder, if any, is probably due to the small quantity of acrid and resinous matter contained in it. For an account of the colouring materials, which are of great importance to the dyer, Ure's Dictionary of Arts and Manufactures and Watt's Chemical Dictionary may be consulted.

Commerce.—Madder is brought into India from the West as well as from Nepaul. It is imported into Bombay from Persia and Afghanistan, that from the latter country appears to be the same as the Madder grown in Europe; it is shipped from Kárachí to the extent of about 1,500 tons annually, and is worth about Rs. 17 per cwt., nearly double the price of Persian Madder. The imports of Madder (chiefly Persian) into Bombay do not exceed 7,000 cwts. annually.

VALERIANEÆ.

Nardostachys Jatamansi, *D. C., Mem. Valer.* 7, *t.* 1; *Royle Ill.* 242—244, *t.* 54. The rhizome.

Vernacular.—Bálchar (*Hind.*), Jatamasi (*Bomb., Beng.* and *Tam.*)

History, Uses, &c.—This plant, in Sanskrit Jatamansi, has from a very remote period been in use among the Hindus as a perfume and medicine. It is mentioned by Susruta, and is prescribed by Hindu physicians as a nervine tonic and aromatic adjunct in the preparation of medicinal oils and ghritas (butters). In the Pharmacopœia of India it is stated that Jatamansi enters into the composition of a nostrum, highly recommended in the treatment of epilepsy by Susruta. Dutt, in his Hindu Materia Medica (p. 180), says:—"I do not find in Susruta's work any prescription for epilepsy, containing Jatamánsi, except the following, in which, however, it can hardly be said to be an active ingredient. Take of the pulse of Phaseolus Roxburghii, barley, jujube fruit, seeds of Crotalaria juncea, bdellium, jatamánsi root, the ten drugs collectively called dasamula (see Tribulus terrestris), and chebulic myrobalans equal parts, and prepare a decoction in the usual manner. This decoction is recommended to be administered with the addition of clarified butter and goat's urine." Arabic and Persian writers describe Jatamánsi under the name of Sumbul and Sumbul-i-Hindi, the latter term being used to distinguish it from Valerian, which is sometimes called Sumbul. The author of the Makhzan-el-Adwiya says that it is the Nardín of the Greeks (Dioscorides, I. 6.), and compares the root to the tail of a sable. He considers it to be deobstruent and stimulant, diuretic and emmenagogue, and recommends it in various disorders of the digestive and respiratory organs, and as a nervine tonic in hysteria. He also notices the popular opinion that it promotes the growth and blackness of the hair. Jatamánsi in doses of 45 grains is often employed as an expectorant in coughs and colds.

Ainslie notices that the Vytians in Lower India prepare a fragrant and cooling liniment for the head from this drug, and also prescribe it internally as a purifier of the blood. Sir W. Jones thought that the Spikenard ointment of the ancients might have been made from N. Jatamánsi. (Asiat. Res. II., p. 405, and IV., p. 109.) However this may be, there can be no doubt that Jatamánsi has been used in India for a similar purpose from a very early date, and that the principal use of the drug at the present time is for making hair washes and ointments.* Sir W. O'Shaughnessy states, as the result of his experience with Jatamánsi, that it is a prefect representative for Valerian. (Bengal Disp., p. 404.) It is very desirable that further trials should be instituted with this promising drug, which can be procured, at a small cost, in almost all the bazars throughout India. Care should be taken to select good specimens for trial, as the central portion of the root is often destroyed by insects.

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* The hair-wash in common use among Indian women, and called Angalepan, Angodvartan, Sughandi-púri or Uṭneṇ, is composed of Gávala (seed of Prunus mahalib), Kápúrkachri (Hedychium spicatum), Vála (Andropogon muricatum), Pách (Pogostemon Patchouli), Jatamánsi (Nardostachys Jatamánsi), Ouplate (Saussurea Lappa), Musta (Cyperus rotundus), Dauna (Artemisia Sieversiana), and Murwa (Origanum, several species). Other articles are sometimes added.

Description.—The drug consists of a short portion of rhizome about as thick as the little finger, of a dark grey colour, surmounted by a bundle of fine reddish-brown fibres, the whole forming an object not unlike the tail of a sable or martin. The fibres are produced by an accumulation of the skeletons of the leaves, and are matted together, forming a kind of network; amongst them the remains of flower-stalks may be found. The odour of the drug is heavy and peculiar, like a mixture of Valerian and Patchouli, the taste bitter and aromatic. When the central portion is removed and cut across, it is seen to consist of a thin cortical portion connected with the central woody column by four medullary bands, between which are situated large canals which contain the fibro-vascular bundles.

The central woody column is of a red-brown colour, angular and jointed, having a certain amount of resemblance to the vertebræ in the tail of an animal. 56 lbs. of Jatamánsi distilled by Kemp, yielded 3 fluid ounces of a brown coloured essential oil, having a molecular rotation of—19·5 in 100 mm., sp. gr. at 82° F. 0·9748.

Commerce.—Jatamánsi is brought from the mountainous districts of Northern India.

Value.—Re. ¼ per lb.

Valeriana Hardwickii, *Wall., Pl. As. Rar., t.* 263. The rhizomes.

Vernacular.—Tágger (*Hind.* and *Beng.*), Tagger-ganthoda (*Bomb.*)

History, Uses, &c.—We know hardly anything of the history of this drug; it does not appear to be mentioned in the standard

Hindu works on Materia Medica, but Roxburgh states that the Valeriana Hardwickii, the Chammaha of the Nepalese, is a medicinal plant among that people. (Flor. Ind. II., p. 167.) Wallich says (Pl. As. Rar., p. 40) : nomen omnium specierum in Napalia, *Chamaha ;* no doubt several species of Valerian are collected to form the commercial article. It is probable that Tágger has long been used in India more as a perfume than as a medicine, just as it is at the present time. The drug appears to have attracted the attention of Mahometan physicians, as we find it described by them as an Indian kind of Asárun (Asarabacca). The author of the Makhzan-el-Adwiya, who wrote in India, describes several kinds of Asárun, and says that the kind known as Tágger in India is to be preferred. The medicinal properties attributed to it by him resemble those of N. Jatamánsi. Among European writers we find the drug mentioned by Royle (Antiquity of Hindu Med., p. 82,) as being used for medicinal purposes in Nepal and Northern India.

According to Dr. Adams (Trans. of Paulus Ægineta III., 264,) the Syrian nard of the ancients was probably this drug. In Bombay Tágger is by no means well known; it is used chiefly as a perfume, but there can be little doubt that it would prove an efficient substitute for Valerian.

Description.—The rhizomes are crooked, about two inches long and from ¼ to ½ an inch in diameter, of a dull brown colour, marked with transverse ridges, and thickly studded with circular prominent tubercules, to a few of which thick rootlets still remain attached. The crown is marked by a number of bracts ; the lower end is blunt. The rhizome is very hard and tough, and the fractured surface greenish brown. The odour is like Valerian, but much more powerful.

Microscopic structure.—Examined under the microscope the outer bark is seen to be composed of ten or twelve layers of compressed cells ; within this is a starchy parenchyma, and next to it a cambium layer ; within the cambium layer is a broken ring of vascular bundles, and lastly, a starchy parenchyma, thickly studded with conglomerate masses of large cells, having greenish-yellow contents of a resinous appearance.

Chemical composition.—No examination has been made.

Commerce.—Tágger ganthoda comes from the temperate Himalayas, from Kashmir to Bhotan, and from the Khasia mountains.

Value.—Rs. 7 per Surat maund of 37½ lbs.

COMPOSITÆ.

Vernonia anthelmintica, *Wild., Burm. Thes.* 210, *t.* 95; *Rheede, Hort. Mal. ii., t.* 24. The achenes.

Vernacular.—Kálí-zírí, Somráj, Bukchi, (*Hind.* and *Beng.*), Kálí-jírí (*Bomb.*), Káttu-shiragam (*Tam.*), Káralye (*Mar.*)

History, Uses, &c.—The Sanskrit names of this common Indian plant are Somaráji, Avalguja, and Vákuchi; it has long been highly esteemed as one of the principal remedies for white leprosy (leucoderma) and other skin diseases, and is also used as an anthelmintic in combination with other remedies. For administration in skin diseases, such as psoriasis and lepra, Chakradatta directs the drug to be powdered along with an equal quantity of black sesamum, and a drachm of the powder to be taken in the morning with tepid water after perspiration has been induced by exercise or exposure to the sun; the diet should consist of milk and rice. In leucoderma, a decoction of emblic myrobalans and catechu is given with the addition of the powdered vakuchi. Externally it is used in skin diseases in a variety of forms, such as paste, oil, &c. (Chakradatta in Dutt's Hindu Mat. Med., p. 183.) The author of the Makhzan-el-Adwiya describes Káli-zírí, and informs us that it is given internally to remove phlegm and worms from the intestines, and that a poultice or plaster of it is used to disperse cold tumours. He concludes by saying that the drug is not often prescribed internally, as it is thought to have injurious effects, but that it is much used as a cattle medicine. Ainslie says:—

"The small dark-coloured and extremely bitter seeds of this annual plant are considered as powerfully anthelmintic, and are also an ingredient of a compound powder prescribed in snake-bites." Rheede tells us that an infusion of them is given on the Malabar Coast for coughs and against flatulency. The dose of the seed in powder, when administered in worm cases, is one pagoda weight twice daily. (Materia Ind. II., p. 54.) According to the Pharmacopœia of India, the ordinary dose of the bruised seed, administered in electuary with honey, is about 1½ drachm, given in two equal doses at the interval of a few hours, and followed by an aperient. Dr. Æ. Ross speaks favourably of an infusion of the powdered seeds (in doses of from 10 to 30 grains) as a good and certain anthelmintic for ascarides. In Travancore the bruised seeds, ground up in a paste with limejuice, are largely employed as a means of destroying pediculi. Dr. Gibson, as the result of personal experience, regards them as a valuable tonic and stomachic in doses of 20 to 25 grains; diuretic properties are also assigned to them. (Pharmacopœia of India, p. 126.) In the Concan the following formula is in vogue as an antiperiodic—Vernonia seeds, Chiretta, Picrorhiza root, Dikamálí, Rocksalt and Ginger, p. æq. Powder, and give 6 massas in cold water, in which a red hot tile has been quenched, every morning.

Description.—The achenes are about 3-16th inch long, of a dark brown colour, covered with whitish scattered hairs, cylindrical, tapering towards the base, marked with about ten paler longitudinal ridges, and crowned with a circle of short brown scales. The taste is nauseous and bitter.

Chemical composition.—The drug contains no alkaloid or glucoside, but a considerable quantity of resin, which is probably the active principle.

Commerce.—The plant is common in waste places throughout India. The country people collect the fruit and bring it for sale in the cold weather.

Value.—Rs. 3½ per Surat maund of 37½ lbs.

Vernonia cinerea, *Less. Rheede Hort. Mal. x., t.* 64; *Willd. Phyt. ii., t.* 6, *f.* 1.

Vernacular.—Síra-shengalanír (*Tam.*), Kúksím (*Beng.*), Sahadevi (*Sans.*), is mentioned by Ainsile (Mat. Ind. II., p. 263,) as being used in medicine by the Hindus, in decoction, to promote perspiration in febrile affections. This plant is a common weed in this part of India, but does not appear to be made use of medicinally. It has an herbaceous, erect-branched rather hoary stem, with closely set short hairs ; leaves petioled, lowermost rounded, the others obovate-oblong, somewhat toothed, rather hoary beneath; corymb lax, dichotomous; heads of flowers peduncled; involucre scales lanceolate, linear-acuminated ; flowers purple.

Elephantopus scaber, *Linn.* The herb.

Vernacular.—Gobhi (*Hind.*), Gojiálata (*Beng.*), Hastipata (*Bomb.*), Anashovadi (*Tam.*)

This plant, which Ainslie calls Prickly-leaved Elephant's Foot, is very common in shady places in Bombay, such as the Mahim woods. Rheede tells us that a decoction of the root and leaves is given, on the Malabar Coast, in cases of dysuria. The plant is noticed by Sanskrit writers under the name of Gojihbá: it has a fibrous root; the leaves are chiefly radical and spread flat upon the ground; they are oblong, wrinkled, crenulate and very hairy; the flower stalk is branched, about a foot high, bearing a few small leaves and heads of flowers with pale purple florets. As a medicine it appears to be simply mucilaginous.

Lamprachænium microcephalum, *Benth.*

Syn.—Decaneurum microcephalum.

Vernacular.—Brahmadandi (*Bomb.*), has flowers which smell like Chamomile, and is used medicinally as an aromatic bitter. It has a branched, scabrous, pubescent stem ; leaves petioled, elliptic-acuminate, gradually attenuated into the petiole, pubescent above, hoary and tomentose beneath; heads of flowers small, solitary, at the apex of the branches; scales of the involucre squariose, hoary and tomentose beneath, exterior ones lanceolate-acuminate, bristle pointed, ciliated; seeds smooth, shining, without ribs. (Bombay Flora, p. 122.)

Eupatorium Ayapana, *Vent., Hort. Malm., t.* 3. The plant.

Vernacular.—Ayapana (*Hind.* and *Bomb.*), Ayapani (*Tam.*)

History, Uses, &c.—Ventenat found this plant growing on the banks of the river of the Amazons, it is also a native of Cayenne; another species, *perfoliatum,* is considered as a febrifuge in America. The Ayapana has been cultivated in India for a considerable time. Ainslie says of it:—"This small shrub, which was originally brought to India from the Isle of France, is as yet but little known to the native practitioners; though, from its pleasant, subaromatic but peculiar smell, they believe it to possess medicinal qualities. At the Mauritius it is in great repute, and there considered as alterative and antiscorbutic; as an internal remedy it has certainly hitherto much disappointed the expectations of European physicians. An infusion of the leaves has an agreeable and somewhat spicy taste, and is a good diet drink; when fresh and bruised, they are one of the best applications I know for cleaning the face of a foul ulcer." (Mat. Ind. II., p. 35.) Mr. Dyer informed Ainslie that the plant was cultivated in the island of Bourbon for the purpose of being dried and sent to France, where it was used for making a kind of tea used as a substitute for the tea of China. According to Guibourt it is now almost forgotten. (Hist. Nat. 6^{me} Ed. III., 68.) In the Pharmacopœia of India there is the following notice of Ayapana:—"A South American plant, naturalized in various parts of India, Java, Ceylon, &c., and generally known by its Brazilian name, Aya-pana. The whole plant is aromatic, with a slightly bitter sub-astringent taste. The exaggerated ideas of its virtues formerly entertained are now exploded; but there is reason to believe that it is a good stimulant, tonic, and diaphoretic. According to the statements of Bouton, (Med. Plants of Mauritius, p. 96), it appears to hold a high place amongst the medicinal plants of the Mauritius, being there in daily use in the form of infusion, in dyspepsia and other affections of the bowels and lungs. In the cholera epidemics in that island in 1854-56, it was extensively used for restoring the warmth of the surface, the languid circulation, &c. As an antidote to snake-bites it has been used, both internally and externally, with alleged success. (Madras Quart. Med. Jour., IV., 7.) In Bombay it is not uncommon in gardens, and though not generally known, is held in considerable esteem by those who are acquainted with it. Ayapana may be compared with chamomile in its effects, it is stimulant and tonic in small doses and laxative when taken in quantity; the hot infusion is emetic and diaphoretic, and may be given with advantage in the cold stage of ague and in the state of depression which precedes acute inflammatory affections. The infusion may be made with 1 oz. of the herb to a pint of water, and be given in 2 oz. doses every three hours.

Description.—A small shrubby plant, 5 to 6 feet high; branches straight, reddish, with a few simple scattered hairs; young shoots have a somewhat mealy appearance, due to the presence of small particles of a white balsamic exudation; leaves opposite, in pairs, their bases uniting round the stem, about 4 inches long and ¾ inch broad, fleshy, smooth, lanceolate, attenuated at the base; midrib thick and reddish; flowers like those of the groundsel, purple. The odour of the plant is aromatic, somewhat like ivy, but more agreeable; taste bitter and aromatic, peculiar.

Sphæranthus indicus, *Linn., Burm. Flor. Zeylan., t.* 94, *f* 3; *Wight Ic., t.* 1094; *Rheede Hort. Mal. x., t.* 43. The plant.

Syn.—S. mollis.

Vernacular.—Mundi, Gorakh-mundi (*Hind.* and *Bomb.*), Murmuria (*Beng.*), Kottak-karandai (*Tam.*)

History, Uses, &c.—This plant, which is very common in rice fields about Bombay, is called in Sanskrit Munditika, and is considered by the Hindus to have anthelmintic properties. The dose of the powdered herb is about a scruple or a scruple and a half twice daily, but more may be given. Rheede, who speaks of the plant under the name of Adaca Manier, tells us that the powder of the root is considered stomachic, and that the bark ground and mixed with whey is a valuable remedy for piles. Burman calls it Sphæranthus purpurea. Forskahl speaks of it under the name of *polycephalos,* and Dr. Horsfield, in his account of Javanese medicinal plants, informs us that the inhabitants of Java consider it as a useful diuretic. (Ainslie Mat. Ind. II., p. 167.) By some this plant has been supposed to be the Kamázariyús* of Arabic writers, but the author of the Makhzan-el-Adwiya says that this is a mistake and describes Mundi in a separate article. He speaks of it as a powerful tonic, deobstruent and alterative, and observes that the odour of the plant may be perceived in the urine and perspiration of those who are taking it. The administration of the drug is recommended in bilious affections, and for the dispersion of various kinds of tumours. The distilled water is mentioned as one of the best preparations; it is directed to be made in the same manner as rose water. Mír Muhammad Husain also informs us that the Hindus use the bark, and make a kind of confection of the young plant by rubbing it up with clarified butter, flour and sugar; a portion of this taken daily is said to be a good tonic, and to prevent the hair turning white or falling off. Several other somewhat similar preparations of different parts of the plant are mentioned by him, and are described as preservatives of the animal powers. An oil prepared from the root, by steeping it in water and then boiling in oil of Sesamum until all the water is expelled, taken fasting every morning for 41 days in doses of 2 dirhems, is said to be a powerful aphrodisiac. تقویت باه بحدے بخشد کہ شرح نتوان نمود

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* χαμάιδρυς Teucrium chamædrys, *Linn.* Petit Chêne, Fr. Ground Oak or Germander, considered to be tonic, diuretic and sudorific, one of the ingredients of the celebrated Portland Powder. Conf. Dios. iii., 103.

Description.—Plant generally about 8 inches high, winged; leaves thick, sessile, decurrent, obovate, bristle-serrate, covered with down, consisting of long white hairs; flower heads solitary, mostly terminal, sub-globular, the size of a small marble, purple when fresh, but lose their colour when dried; roots fibrous. The drug generally consists of the whole plant, but the capitula are sometimes sold separately. The taste is somewhat bitter, the odour of the capitula terebinthinate.

Chemical composition.—150 lbs. of the fresh herb distilled with water in the usual manner yielded a very deep sherry-coloured, viscid essential oil, very soluble in water, and clinging to the side of the vessel, so that only half an ounce could be collected. The oil does not appear to have any rotatory power, but it is difficult to examine on account of its opacity.

Blumea sp., *Vernacular*—Nimúrdi (*Mar.*), a strongly camphoraceous Blumea common in the neighbourhood of Bombay, and used by the country people to drive away fleas. It appears to be a new species. 150 lbs. of the fresh herb in flower submitted to distillation with water in the usual manner yielded two ounces of a light yellow essential oil, having a specific gravity of 0·9144 at 80° F., and an extraordinary rotating power, 100 millimetres turning the ray 66° to the left. Mr. D. S. Kemp, who made the observation, also checked it by examining a 10 per cent. solution in alcohol which gave 6·6°. This Blumea is of interest as the possible source of an insect powder; it is also called Dákhta Agintumba, and the juice of the root is given to pregnant women who complain of pains in the belly from the motion of the fœtus. The names Bhámbhrur and Bhambhurda (*Mar.*) are applied to several strong smelling Blumeas.

Kamafitus. Mr. Moidín Sheriff identifies this drug with a plant which he names Blumea aurita, and which he thinks to be the Kakrondah of Hindu medicine. The Kamáfítus χαμαιπίτυς of the Greeks was Ajuga Chamæpitys, *Schreber*, a labiate plant. This plant is correctly described in the Makhzan-el-Adwiya, the author following closely the description given by Dioscorides (iii., 166), and explaining that Kamáfítus is a Greek word which means *Ground Pine* (صنوبرالارض); he also mentions the Latin name *Abiga* (Plin. 24, 6), and lastly the Indian name Kakrondah (ककरौन्दा), about which he seems to be very doubtful, as he describes Kakrondah in a separate article in the following terms:—"A plant about 2 cubits high, with many crowded branches, springing from one root; leaves long, erect, like those of the endive, but rather larger, softly pubescent, of a dark green colour, and offensive odour; taste astringent, but not powerfully so. Flowers small, yellow; seeds small and black, on a receptacle like the cone-shaped fruit of the Anemone (كوزۀ شقايق) and marked with lines; root slender, white, without much taste."

This description of the Kakrondah of Hindustan might do for Blumea lacera, but the only possible connection between Kamáfítus and a Blumea is that both plants have a turpentine odour. Kamáfítus not being obtainable in India, the Blumea may have been accepted by some as a substitute for it.

Achillœa millefolium, *Linn.*, *Eng. Bot.* 758; *Reich. Ic. Fl. Germ.*, *t.* 1826.

Vernacular.—Rojamari (*Bomb.*), Milem rama (*Port.*)

This plant is sold as rosemary by the native herbalists. Although a native of Europe, it is so far naturalized as to be commonly employed as a medicine in this Presidency. It is used as a bitter, and in medicated vapour baths for fevers. (S. Arjun.)

Different species of Achillœa have been used medicinally from a very early date. According to Pliny the generic name was given to these plants because Achilles was the first to use one of them as a vulnerary. The genus is considered to have stimulant, tonic, emmenagogue and antihemorrhoidal properties; A. millefolium is employed in Italy in intermittent fevers. A. moschata (Génepi blanc) is an Alpine plant with a musky odour, having sudorific and healing properties. At Engadine, in Switzerland, a volatile oil is extracted from it called Esprit d'Iva. For administration ½ oz. of A. millefolium may be infused in a pint of water and reduced to 6 ozs., of this 1 oz. may be given every hour.

Chemical composition.—Achillein, the bitter principle, is an amorphous, yellowish-brown substance soluble in boiling water and alcohol, insoluble in ether, but when a little acid is added it becomes soluble, soluble in ammonia. The Achillaic acid of Zanon (Ann. der Chem. u. Pharm. LVIII., p. 31,) is considered by Hlasiwetz to be aconitic acid.

Achillœa santolina, *Linn.,* Biranjásif or Bu-i-máderán (*Pers.*) is used as a tonic in Persia and Sind. It appears to have properties similar to those of A. millefolium. The flowers are preferred. The author of the Makhzan identifies Biranjásif with the *αρτεμισία* of the Greeks. (Conf. Dios. iii., 18, 19 and 20, also iv. 34 *περὶ αχιλλείου.*)

In the Tuhfat-el-Muminín, the description of Biranjásif is unmistakably that of an Achillœa.

Erigeron asteroides, *Roxb.* The plant.

Vernacular.—Maredi, Sonsali (*Bomb.*)

History, Uses, &c.—This annual, a native of dry cultivated lands, flowering during the cold season, does not appear to have been noticed by any of the European writers upon the Indian Materia Medica. Last year I noticed it being offered for sale in the bazar as a stimulating and diuretic medicine.

Several species of Erigeron are used as diuretics in America, and under the name of ηριγέρων Dioscorides describes a plant with yellow flowers, which is generally supposed to have been a species of Senecio. (Conf. Dios. iv., 92.)

Description.—Stem erect, from 6 to 12 inches high, ramous near the ground, round, hairy; branches ascending, longer than the stem; leaves alternate, the inferior ones short, petioled, oval or obovate, grossly toothed, the superior ones sessile, oblong, sublyrate, all are covered with soft down and are somewhat glutinous; flowers a few, terminal, peduncled, large, flat; hermaphrodite florets of the disc yellow; the female ones ligulate, those of the border blue, generally entire and only emarginate. (*Roxb.*)

The herb is brought for sale with other simples from Guzerat.

Ageratum conyzoides, *Linn.*, *Hooker's Ex. Flora.*, *t.* 15.

Vernacular.—Osári, Sahadevi (*Bomb.*)

A common weed appearing after the rains; annual, 1 to 2 ft., hispidly hairy, leaves petioled, ovate crenate, heads small, in dense terminal corymbs, bracts striate, acute, ray-fl. many, pale blue or white, achenes black, pappus scales 5-awned, often serrate below. (Fl. Br. Ind. III. 243.) The whole plant has a strong aromatic, rather disagreeable, smell, and has a reputation among the Hindus as an external application in agues; it is also worn as a charm against ague when dug up on Sunday morning with the proper ceremonies. The juice is also said to be a good remedy for prolapsus ani; it is freely applied, and the parts replaced.

Eclipta alba, *Hassk.*, *Lam. Ill.*, *t.* 687. The plant.

Syn.—E. prostrata.

Vernacular.—Bhangra (*Hind.*), Bhangra, Máka (*Bomb.*), Karisha langauni, Kaikeshi, Kaivishi-ilai (*Tam.*)

History, Uses, &c.—This is a very common weed in the rainy season, and may be found in damp places at other times of the year. It is called in Sanskrit Kesarája, and is an old-established Hindu medicine, principally used as a tonic and deobstruent in hepatic and splenic enlargements, and in various chronic skin diseases; in the latter case it is also pounded and applied externally. There is a popular opinion that the herb taken internally and applied externally will turn the hair black, and some Hindu books contain accounts of its power as a hair dye. Mahometan writers follow the Hindus in their descriptions of the medicinal properties of Bhangra, which is known to the Arabs as Kadím-el-bint. The author of the Makhzan-el-Adwiya describes three kinds—white, black, and yellow. The latter is the Wedelia calendulacea, *Less*, and according to Dutt is the kind mostly used in Bengal. Ainslie mentions it as Peela Bhangra, and describes it in the following terms:—"It has an herbaceous stem, a foot high, and nearly erect; leaves quite entire, opposite, lanceolate, bluntish, with yellow flowers, terminating, solitary, and on a very long peduncle. The leaves, seeds, yellow flowers, in a word the whole of this low growing plant, which is pleasant and somewhat aromatic to the taste, is used in medicine; it is considered as deobstruent, and is prescribed in decoction, in the quantity of half a teacupful twice daily." The white Bhangra of the Makhzan is the Eclipta alba, and the black probably a variety of the same plant with darker-coloured stems. Mahometan writers ascribe the same properties to these plants as the Hindus. Roxburgh says:—"In tattooing, the natives after puncturing the skin, rub the juicy green leaves of E. prostrata over the part, which gives the desired indelible colour, *viz.*, a deep bluish black." Mr. Wood considers that the plant will be found eventually of greater service than taraxacum in hepatic derangements. The expressed juice is recommended as the best form of administration in the Pharmacopœia of India. In Bombay the natives use the juice in combination with aromatics, such as Ajowan seeds, as a tonic and deobstruent, and give two drops of it with eight drops of honey to new-born children suffering from catarrh. The following prescription is used in the Concan for tetanus :—Máka juice 1 tolá, juice of Leucas cephalotes (Tumba) ¼ tolá, Ginger juice 2 tolás, juice of Vitex trifolia 1 tolá, leaf juice of Sesbania grandiflora 3 tolás ; to be boiled with four times the quantity of cocoanut juice and a little rice and treacle to form a Khir, to be given twice a day. A succus has been used by European practitioners, and found fully as efficient as Succus Taraxaci.

Description.—A small prostrate or ascending plant, stem reddish, leaves lanceolate, attenuated at the base, with waved edges, 1 to 1½ inch long. The whole plant is rough to the touch from the presence of numerous adpressed white hairs. The flower heads are in pairs, one having a peduncle twice as long as the other ; flowers numerous, corolla white ; root much branched, woody ; rootlets fibrous, about 4 inches in length. The plant has a strong disagreeable smell when bruised. The juice turns black on exposure to the air.

Microscopic structure.—The structure of the hairs is peculiar ; the base is red and turned upwards, upon it is attached a conical white glandular hair. The seeds are wedge-shaped, about the size of lettuce seed, and marked with rough irregular prominences on both sides.

Commerce.—Not an article of commerce, but the dried herb is generally obtainable in the drug shops.

Guizotia abyssynica, *Cass., Wight Ill., t.* 132 ; *Bot. Mag., t.* 1017. Expressed oil of the seeds.

Syn.—G. oleifera.

Vernacular.—Rámtíl, Kálátíl (*Hind., Beng.* and *Bomb.*), Valesulú (*Tel.*)

Description, Uses, &c.—This is an annual, herbaceous, erect plant ; leaves opposite, long, lanceolate, coarsely serrated ; peduncles elongated, subcorymbose ; flowers large, bright yellow. It is commonly cultivated in the neighbourhood of Bombay and in the Deccan as a monsoon crop. The oil is sweet, and may be used for the same pharmaceutical purposes as sesamum oil. In the Concan it is much esteemed for culinary purposes and for making sweetmeats. According to Drury, an acre will produce about two bushels of seed, worth in Mysore about Rs. 3½ per maund. In Bombay it sells for Rs. 6½ per pharrah (about 35 lbs.)

The achenes are of a greyish-black colour, about $\frac{2}{10}$ths of an inch long, somewhat angular from lateral compression, tapering towards the base, quite smooth, taste oily and nutty. They are known in Europe as "Niger seed." The seeds contain 7·02 per cent. water, 43·22 oil, 19·37 albuminous substances, 13·37 sugar, gum, &c., 14·33 cellulose, and 3·48 ash = 100·08. Nitrogen = 3·10 per cent. (Anderson, Highland Agr. Soc. Jour., New Series, No. 69, p. 376, and Watt's Chem. Dict. II., p. 953.)

Glossocardia linearifolia, *Cass.*, *Wight Ic.*, *t.* 1110.

Syn.—G. Bosvallea.

The plant is known in Bombay by the name of Phatara-suva, which means rock anethum. In the Poona and Sholapore districts it is called Pitta-pápada, a name also given to Fumaria as well as to several acanthaceous plants. Dr. S. Arjun informs me that he has found it growing on rocky ground towards Chinchpoogly in the island of Bombay during the rains. It is not sold in the Bombay shops, but is the Pitta-pápada of the Poona druggists, and according to Dalzell and Gibson is much used in female complaints, the nature of which they do not specify. G. linearifolia is a small annual, with many stems, diffuse; leaves alternate, much divided, linear at the base; heads of flowers solitary, yellow, on short naked peduncles. It has a bitter taste.

Spilanthes oleracea, *Linn., Jacq. Vind.* 2, *t.* 135. Para cress of Brazil.

Vern.—Ákarkara (*Bomb.*)

Is commonly cultivated in gardens in Bombay. It is a small annual plant with round smooth succulent branching stems; the leaves are opposite, petioled, subcordiform, subdentate. The flower heads are solitary at the end of pedicels longer than the leaves, of a conical form and of the size of an acorn; they are entirely composed of yellow or brownish yellow hermaphrodite subular flowers.

The achenes are compressed with ciliated margins, and are surmounted by two naked awns. The whole plant is very acrid, but the flower heads are especially so, having a hot burning taste, which causes profuse salivation. It is on this account that the plant has been named Ákarkara by the gardeners. The name properly belongs to the Pellitory root of the shops. The flower heads are sometimes chewed to relieve toothache. Buchheim has obtained the crystalline substance *pyrethrin* from this plant. Pyrethrin is resolved by alcoholic potash into *pyrethric acid* and *piperidine*. The S. Acmella is a native of India, and has similar properties.

Grangea Madraspatana, *Poir., Wight Ic., t.* 1097.

Vern.—Máshipatri. (*Tam.*)

The leaves are used as a stomachic, deobstruent, and antispasmodic. (*Ainslie.*)

Description.—Stems procumbent or diffuse, villous; leaves sinuato-pinnatifid, the lobes obtuse; peduncles terminal or opposite the leaves; heads of flowers yellow, solitary, subglobose.

Hab.—Rice fields in the cold weather. (*Bomb. Flora,* p. 124.)

Artemisia vulgaris, *Linn.*, *Wight Ic.*, *t.* 1112; *Rheede Hort. Mal. x.*, *t.* 45; *Eng. Bot.*, 978. The plant.

Syn.—A. indica.

Vernacular.—Nágdown (*Hind.* and *Beng.*), Surband (*Bomb.*), Máshipatri (*Tam.*)

History, Uses, &c.—This plant, in Sanskrit Nagadamani, may be regarded as the Wormwood of India. The Hindus consider it to be a valuable stomachic, deobstruent, and antispasmodic; they prescribe it in infusion and electuary, in cases of obstructed menses and hysteria. Externally it is used in fomentations. A. vulgaris is probably one of the kinds of *afsantín* described in Mahometan works; but owing to the number of species which belong to the genus, and which all have very similar properties, it is difficult to decide this point. The authors of the Pharmacopœia of India say:—"The strong aromatic odour and bitter taste of this plant, scarcely distinct from A. vulgaris,* indicate stomachic and tonic properties. Dr. Wight (Illust. II. 92,) states that the leaves and tops are administered in nervous and spasmodic affections connected with debility, and also that an infusion of them is used as a fomentation in phagedenic ulceration. Dr. L. Stewart describes an infusion of the tops and leaves as a good, mild stomachic tonic."

Description.—Erect, suffruticose; leaves ashy and tomentose beneath, lower pinnatifid, upper trifid, uppermost undivided or with lanceolate lobes; lobes of the lower leaves toothed or cut; heads of flowers racemose-panicled, ovate; panicle leafy, spreading, partial racemes pendulous before flowering, young involucre a little tomentose, at length glabrous; exterior scales foliaceous, acute, interior membranaceous, obtuse; corol naked. (Roxb. Fl. Ind. III., 419.)

Commerce.—The dry is plant is sold by the herbalists, and the fresh tops in the markets. Value, Rs. 6 per Surat maund of 37½ lbs.

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* The *Flora of British India* reduces A. indica to A. vulgaris, a plant common in Europe, and by some considered to be the αρτεμισια of the Greeks, which Sibthorp refers to A. arborescens, apparently an arborescent form of A. vulgaris. (Conf. Dios. iii., 118.)

Artemisia Sieversiana, *Willd.* The plant.

Vernacular.—Afsantín, Downa (*Pers.* and *Bomb.*)

History, Uses, &c.—Under the Greek name of Afsantín (*αψίνθίον*), Mahometan writers describe several kinds of Artemisia, but it is useless to attempt to identify these, as the descriptions are insufficient. The drug current in Bombay is derived from the plant at the head of this article; it is imported from Persia, and has for many years been cultivated at Bandora, in the neighbourhood of Bombay, for the sake of the fresh herb, which is always obtainable in the market, and is much valued by the Hindus. The cultivation appears to have been in the hands of a few Christian families for several generations; they also cultivate Sweet Marjoram. The two plants are called Ázarona and Mázarona by the native Christians, and were no doubt introduced into the country by the Portuguese. Medicinally Afsantín is esteemed as a tonic, deobstruent, febrifuge, and anthelmintic, and it is applied externally as a discutient and antiseptic. The hakíms prescribe it in hypochondriasis, jaundice, dropsy, gout, scurvy, &c.; also as an emmenagogue, and in hysterical affections.

Description.—When not in flower the plant much resembles Southernwood (A. abrotanum), * but is more hoary; the leaves of the stem are bipinnatifid, the floral leaves usually trifid; the flower heads globose, as large as a pea, stalked, nodding; involucres scarious; odour camphoraceous and very aromatic.

Chemical composition.—The Wormwoods contain absinthate of potash, a bitter substance, and a green volatile oil having a camphoraceous odour. *Absinthin* ($C^{16} H^{22} O^{5}$), the bitter principle, is prepared, according to Luck, by exhausting the leaves with alcohol, evaporating to the consistence of a syrup, and agitating with ether. This ethereal solution is evaporated to dryness, and the residue treated with water containing a little ammonia, which dissolves the resin, and leaves the absinthin nearly pure. To complete the purification it is digested with weak hydrochloric acid, washed with water, dissolved in alcohol, and treated with acetate of lead, as long as a precipitate is formed. After the removal of this precipitate by filtration, the excess of lead is precipitated by sulphuretted hydrogen, and the solution is evaporated. The absinthin then remains as a hard confusedly crystalline mass, possessing an extremely bitter taste. It is but slightly soluble in water, very soluble in alcohol, and less so in ether. It possesses distinctly acid characters, and is dissolved by potash and ammonia. The *Sal Absinthicum* of the old Pharmacopœias was nothing more than carbonate of potash obtained by incineration of the plant.

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* The *αβρότονον* of the Greeks so highly recommended by Galen in fomentations and as an anthelmintic. He also prescribed frictions with the oil in intermittents. The ashes were also used, and Pliny mentions a tincture (14, 19). Ibn Sina repeats what Dioscorides says, and adds that it produces abortion; it is probably the Afsantín-i-Rumi of the bazar.

Commerce.—Afsantín is imported from Persia; the entire plant is found in the bales, and owing to its toughness, is seldom much broken.

Value.—Rs. 5 to Rs. 7 per Surat maund of 37½ lbs.

Centipeda orbicularis, *Lour.*, *Wight Ic.*, *t.* 1610; *Burm. Flor. Ind.*, *t.* 58, *f.* 3. The plant.

Syn.—Artemisia sternutatoria.

Vernacular.—Nakk-chikní (*Hind.*, *Beng.*, and *Bomb.*), Shikani (*Mar.*)

Description, Uses, &c.—According to Roxburgh this plant appears during the latter part of the cold season, on cultivated land. The whole plant does not cover a space more than about 6 to 8 inches in diameter. The root is simple, the stems several, branchy, pressing on the earth; all are somewhat woolly; leaves numerous, sessile, wedge-shaped, deeply dentate, villous; flowers axillary or in the divisions of the branches, solitary, sessile, sub-globular, hermaphrodite, florets from 10 to 12 in the centre with the border 4-toothed, coloured and expanding; the female ones very numerous in the circumference, most minute, with the border seemingly 3-toothed, and the toothlets incurved. Receptacle naked. The minute seeds are used as a sternutatory by the Hindus, also the powdered herb. It is administered in ozæna, headaches, and colds in the head. The plant does not grow in this part of India, but the dry herb, both entire and in powder, is always to be obtained in the druggists' shops.

Value.—About annas 6 per lb.

Artemisia maritima, *Linn., Bentl. and Trim., t.* 157. The flower heads.

Vernacular.—Kirmání owa (*Bomb.*)

History, Uses, &c.—Artemisiæ of the section Seriphidium assume great diversity of form; they have been the object of attentive study on the part of the Russian botanists, Besser and Ledebour, whose researches have resulted in the union of many supposed species, under the head of the Linnæan Artemisia maritima. This plant has an extremely wide distribution in the northern hemisphere of the old world, occurring mostly in saltish soils. (Pharmacographia, p. 346.) The wormseed of the Bombay market has been examined by Hanbury, who considers that it does not materially differ from the Russian drug, but is slightly shaggy and mixed with tomentose stalks. He informs us that a specimen of artemisia, No. 3201, Herb. Griffith, Afghanistan, in the Kew Herbarium, has capitules precisely agreeing with the Bombay drug.

Arabic and Persian writers on Materia Medica generally describe wormseed under the name of Shíh, giving as synonyms, Sarifún and Afsantín-el-bahr, evidently the Σερίφον and Αψίνθίον θαλλασσίον of Dioscorides.* In Bombay Shíh is the recognised Arabic name of the drug amongst the hakíms, who prescribe it in doses of from 2 to 3 dirhems as an anthelmintic, and also as a deobstruent and stomachic tonic. In the form of poultice they use it to relieve the pain caused by the bites of scorpions and other venemous reptiles.

Description.—According to Flückiger and Hanbury, "good samples of the drug consist almost exclusively of entire, unopened flower heads or capitules, which are so minute that it requires about 90 to make up the weight of one grain. In samples less pure, there is an admixture of stalks, and portions of a small pinnate leaf. The flower heads are of an elliptic or oblong form, about 1-10th of an inch long, greeenish yellow when new, brown if long kept; they grow singly, less frequently in pairs, on short stalks, and are formed of about 18 oblong, obtuse, concave scales, closely imbricated. This involucre is much narrowed at the base in consequence of the lowermost scales being considerably shorter than the rest. The capitule is sometimes associated with a few of the upper leaves of the stem, which are short, narrow, and simple. Notwithstanding its compactness, the capitule is somewhat ridged and angular from the involucral scales having a strong central nerve or keel. The middle portion of each scale is covered with minute yellow, sessile glands, which are wanting on the transparent scarious edge. The latter is marked with extremely fine striæ, and is quite glabrous; in the young state, and in the Bombay variety of the drug, the keel bears a few woolly colourless hairs. The florets number from 3 to 5; they have in the bud an ovoid corolla, glandular in its lower portion, a little longer than the ovary, which is destitute of pappus. Wilkomm has lately described as the mother plant of wormseed, an Artemisia which he calls A. Cina. It was obtained in Turkestan by Professor Petzholdt, who received it from the people gathering the drug. The specimen kindly communicated to us by Professor Wilkomm, has flower heads which do not entirely resemble the wormseed of trade, in that they have fewer scales." (Pharmacographia, p. 347.)

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* Dios. iii., 25.

Mahometan writers name several varieties of wormseed, but do not describe them with any minuteness. It would seem then that we must be prepared to meet with slight differences in packages of the commercial article, but in any case the drug should have a powerful and agreeable odour resembling cajuput oil and camphor, and a bitter aromatic taste.

Chemical composition.—The following account is extracted from the Pharmacographia:—Wormseed yields from 1 to 2 per cent. of essential oil, having its characteristic smell and taste. The oil is slightly levogyrate, and chiefly consists of the liquid $C^{10} H^{18} O$, accompanied by a small amount of hydrocarbon. The former has the odour of the drug, yet rather more agreeable; sp. gr. 0·913 at 20° C. It boils without decomposition at 173° to 174°, but in presence of $P^2 O^5$ or $P^2 S^5$ abundantly yields cymol. The latter had already been observed by Völckel (1854) under the name of *cynene* or *cinene*, yet he assigned to it the formula $C^{12} H^9$; Hirzel (1854) called it cinæbene. The water which distils over carries with it volatile acids of the fatty series, also *angelic acid.*

The substance to which the remarkable action of wormseed on the human body is due, is Santonin, $C^{15} H^{18} O^3$. It was discovered in 1830 by Kahler, an apothecary of Düsseldorf, who gave a very brief notice if it in the Archiv. der Pharmacie of Brandes (XXXIV., 318). Immediately afterwards, Augustus Alms, a druggist's assistant at Penzlin, in the Grand Duchy of Mecklenburg-Schwerin, knowing nothing of Kahler's discovery, obtained the same substance, and named it Santonin. Alms recommended it to the medical profession, pointing out that it is the anthelmintic principle of wormseed. Santonin constitutes from 1½ to 2 per cent. of the drug, but appears to diminish in quantity very considerably as the flowers open. It is easily extracted by milk of lime, for though not an acid, and but sparingly soluble in water even at a boiling heat, it is capable of combining with bases. With lime it forms santoninate of calcium, which is readily soluble in water. On addition of hydrochloric acid, santoninic acid, $C^{15} H^{20} O^4$, separates, but parts with OH^2, Santonin being thus immediately reproduced.

Santonin forms crystals of the orthorhombic system melting at 170°, which are inodorous, but have a bitter taste, especially when dissolved in chloroform or alcohol. They are colourless, but when exposed to daylight, or to the blue or violet rays, but not to the other colours of the spectrum, they assume a yellow hue, and split into irregular fragments. This change, which takes place even under water, alcohol or ether, is not accompanied by any chemical alteration. This behaviour of Santonin, when exposed to light, resembles that of erythrocentaurin, $C^{27} H^{24} O^{8}$. The latter has been obtained by means of ether, from the alcoholic extract of Erythræa Centaurium, and of some other Gentianaceæ. Mehu has shown that the colourless crystals of that substance, when exposed to sunlight, assume a brilliant red colour, without undergoing any chemical alteration. The colourless solutions of this body in chloroform or alcohol yield the original substance. Yet as to Santonin, Sestini and Cannizzaro (1876) have shown that its dilute alcoholic solution, on long exposure to sunlight, affords a compound ether of photo-santonic acid, namely, $C^{15} H^{13} O^{4} (C^{2} H^{5})^{2}$.

Wormseed contains in addition to the two bodies just described, resin, sugar, waxy fat, salts of calcium and potassium, and malic acid; when carefully selected and dried, it yielded us 6·5 per cent. of ash, rich in silica. (*Op. cit.*, 2nd Ed., p. 389.) Wormseed oil has been investigated (1884) by Messrs. Hell, Sturcke and Ritter, and Messrs. Wallach and Brass. The latter authors confirm the statements of previous observers that the principal constituent of *oleum cinæ* is a compound having the composition $C^{10} H^{18} O$, which, as being an isomer of Borneol, they propose to call '*Cyneol*'; and that this is accompanied by a certain quantity of hydrocarbons with a similar boiling point. But they have also met with another compound richer in oxygen, and having a higher boiling point. Pure cyneol is a liquid having a characteristic but not disagreeable camphor-like odour boiling at 176° to 177° C., and having a specific gravity of 0·92297 at 16° C. It is optically inactive, though the rectified oil from which it is obtained has been found to have a rotation to the left of 2°·9, due to other constituents boiling at higher temperatures. Oxidised by boiling with nitric acid, cyneol yielded besides the lower fatty acids essentially oxalic acid, but no acid of the aromatic series; while the hydrocarbons ($C^{10} H^{16}$ and $C^{10} H^{14}$) accompanying it in the oil yielded upon oxidation always more or less toluylic or terephthalic acid. Cyneol by treatment with gaseous hydrochloric acid is converted into a hydrocarbon ($C_{10}H_{16}$), to which the name '*Cynen*' has been given.

Commerce.—Wormseed is brought to Bombay from Afghanistan and Persia in considerable quantities. Value, Rs. 2½ to Rs. 3 per Surat maund of 37½ lbs. Much of the Santonin sold in the bazar is adulterated to the extent of ¾ of its weight with various substances, amongst which gum and boracic acid have been noticed. An easy test is to expose it to sunlight, which turns the Santonin yellow.

Doronicum pardalianches, *Linn., Jacq. Austr., t.* 350. The rhizome.

Vernacular.—Darúnaj-i-akrabí (*Pers.* and *Bomb.*)

History, Uses, &c.—The author of the Makhzan-el-Adwiya tells us that Darúnaj is a scorpioid knotted root with a greyish exterior and white interior, that it is hard, faintly bitter and aromatic. He describes the plant as having fleshy yellowish leaves of the shape of those of the almond, which lie flat upon the ground. The flower stem he says is hollow; it rises from the midst of the leaves to a height of two cubits, and bears from 5 to 7 scattered leaves thinner and longer than the lower leaves. The flower is yellow and hollow. The plant grows in Andalusia and the mountainous parts of Syria, especially about Mount Yabrúrat, where it goes by the name of Akrabí.* There are two varieties of the drug, Persian and Turkish, the latter is most esteemed. With regard to its medicinal properties, he says that it is a resolvent of phlegm, adust bile, and flatulencies, cardiacal and tonic, useful in nervous depression, melancholy, and impaired digestion, also in pain of the womb, and flatulent dyspepsia.

Besides this it is prescribed for persons who have been bitten by scorpions and other venomous reptiles, and is hung up in houses to keep away the plague; pregnant women wear it round the waist suspended by a silken thread which must be made by the wearer; it is supposed to act as a charm, protecting the fœtus and procuring a painless delivery. Hung up over the bed it prevents night terrors and ensures pleasant dreams. There would appear to be a demand for it in Bombay, as it is kept by all Mahometan druggists.

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* D. pardalianches, Sibthorp tells us, is called *σκορπίδι* in modern Greek. He identifies it with the *ἀκονίτον* of Dioscorides (iv., 75), which that writer describes as having a root like the tail of a scorpion and white like alabaster. Theophrastus calls it *θηλύφονον* and Pliny Thelyphonon.

Description.—Rhizomes scorpioid, occasionally branched, flat, jointed, of a white colour, 3 to 4 inches long, ½ to ¾ inch broad, and about 2-10th of an inch thick. Upper surface scaly, under surface marked by scars of numerous rootlets, a few of which sometimes remain attached; substance brittle and horny, yellowish white, central portion somewhat spongy, odourless. Taste at first insipid, but after a few minutes a sensation of warmth and pricking is felt upon the tongue.

Microscopic structure.—Sections show that the bulk of the rhizome consists of a parenchyme, each cell of which is occupied by a mass having the appearance of inulin, inactive in polarized light; towards the circumference the cells become gradually smaller, and upon the surface become scaly, forming a greyish epidermis. The vascular bundles are of a bright yellow colour, and consist of spiral vessels; they form one irregular ring round the rhizome about midway between the circumference and centre. No starch grains are to be seen in any part of the rhizome.

Chemical composition.—*Inulin* has the same composition as starch, $C^6 H^{10} O^5$, but stands to a certain extent in opposition to that substance, which it replaces in the root system of *Compositæ.* In living plants, inulin is dissolved in the watery juice, and on drying is deposited within the cells in amorphous masses, which in polarized light are inactive, and are not coloured by iodine. There are various other characters, by which inulin differs from starch. Thus, for instance, inulin readily dissolves in about 3 parts of boiling water; the solution is perfectly clear and fluid, not pastelike; but on cooling deposits nearly all the inulin. The solution is levogyre and is easily transformed into uncrystallizable sugar. With nitric acid, inulin affords no explosive compound as starch does. Sachs showed in 1864 that by immersing the roots of many of the perennial *Compositæ*, in alcohol or glycerin, inulin may be precipitated in a crystalline form. Its globular aggregates of needle-shaped crystals then exhibit under the polarizing microscope a cross similar to that displayed by starch grains.

In the roots of the *Compositæ* inulin is accompanied, according to Popp, by two closely allied substances, *Synanthrose*, $C^{12} H^{22} O^{11} + H^{2}O$, and *Inuloid*, $C^{6} H^{10} O^{5} + H^{2} O$. The former substance is soluble in dilute alcohol, devoid of any rotatory power, and deliquescent, the latter is much more readily soluble in water than inulin. (See Pharmgr., Art. Elecampane.) The acrid principle of Darúnaj root has not been examined.

Anacyclus Pyrethrum, *D. C.*, *Bentl. and Trim.*, *t.* 151. The root.

Vernacular.—Ákarkara (*Hind.*, *Beng.*, and *Bomb.*), Akkirakaram (*Tam.*), Akarákarabha (*Sans.*)

History, Uses, &c.—Pellitory root is only mentioned by the later Sanskrit writers, such as Sarangadhara and the author of the Bhavaprakása, who doubtless derived their knowledge of its properties from the Mahometans, who in their turn closely follow the Greeks. The only difficulty is that πύρεθρον is described by Dioscorides as an umbelliferous plant, but with the properties of Pellitory; here the author of the Makhzan comes to our aid and tells us that the Pyrethrum of Dioscorides resembling anethum, is a drug which the Arabs call Úd-el-karih-jibbalí, very common in Syria; it is found at the upper part of Wady Pardah, and, he says, I have seen its fruit; it has a root about a span in length, as thick as the finger, and has many of the properties of pyrethrum. He also quotes Antaki as mentioning two kinds of pyrethrum, *viz.*, Western or the kind described by Ibn Baitar and Syrian, called Ud-el-karih, which is the root of the mountain Turkhún and the kind described by Dioscorides. We also learn from the Makhzan that Turkhún is an Arabic form of Turkhání, a plant common in Persia, especially in Fars and about Shiráz; it is eaten like cress and other herbs with bread and cheese. There are two kinds, wild and cultivated; it is propagated by seed and by cuttings, and has a hot, astringent and sweetish taste; if taken fasting it benumbs the tongue; on this account it is chewed to cover the taste of nauseous medicines. The taste is likened to that of the leaves of the Woodapple (Feronia elephantum). The root of the wild plant is called Ákarkarha. Ainslie says:—"This root is to be found in most of the Indian bazars; though I cannot learn that the plant grows in any part of India. It is a native of Arabia, Syria, Calabria, Crete, and Bohemia, and it is, no doubt, from the first-mentioned of these countries that it is brought to Hindustan, an export from Mocha. I am much inclined to think that it is the root we find noticed by Forskahl in his Materia Medica Khairina under the name of Úd-el-karih. With regard to its Asiatic names, there is this peculiarity, that its Arabic, Persian and Dakhanie appellations are nearly the same. The pungency of the pellitory root is not perceived till it has been chewed for a few seconds, when it occasions at first a glowing heat in the mouth soon followed by pricking sensation in the tongue and lips. The Vytians prescribe an infusion of it, in conjunction with the lesser galangal and ginger, as a cordial and stimulant in lethargic cases, in palsy, and in certain stages of typhus fever; they also order it to be chewed, as a masticatory, for the toothache. It certainly possesses powerful stimulant properties, but is scarcely ever employed in Europe as an internal remedy; though it has been found useful as a sialagogue, and as such, Dr. Thomson says, has been given with success in some kinds of headache, apoplexy, chronic ophthalmia, and rheumatic affections of the face." (Mat. Ind. I., 300.) Mahometan writers consider pellitory to be discutient and attenuant; they prescribe it chiefly in paralytic affections, which they suppose to be caused by phlegmatic humours. The Arabic name Ákarkarha* is said to be derived from Akar and takrih, and means 'causing a sore.' Celsus mentions its use for opening the mouths of wounds. (Lib. V., cap. IV.) The Arabian physicians in the days of Avicenna prescribed pellitory in rigors. In India it is often given to parrots to make them talk.

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* It is also said by some to be a Coptic word, and by others supposed to be of Indian origin.

Description.—The root as found in the shops is simple, 3 to 4 inches long by $\frac{3}{8}$ to $\frac{4}{8}$ of an inch thick, cylindrical or tapering, sometimes terminated at the top by the bristly remains of leaves, and having only a few hair-like rootlets. It has a brown, rough, shrivelled surface, is compact and brittle, the fractured surface being radiate and destitute of pith. The bark, at most 1-25th of an inch thick, adheres closely to the wood, a narrow zone of cambium intervening. The woody column is traversed by large medullary rays in which, as in the bark, numerous dark resin-ducts are scattered. The root has a slight aromatic smell, and a persistent, pungent taste, exciting a singular tingling sensation, and a remarkable flow of saliva. The drug is very liable to the attacks of insects.

Microscopic structure.—The cortical part of this root is remarkable on account of its suberous layer, which is partly made up of sclerenchyme (thick-walled cells). Balsam-ducts (oil cells) occur as well in the middle cortical layer as in the medullary rays. Most of the parenchymatous cells are loaded with lumps of inulin; pellitory, in fact, is one of those roots most abounding in that substance.

Chemical composition.—Pellitory has been analysed by several chemists, whose labours have shown that its pungent taste is due in great part to a resin, not yet fully examined. The root also contains a little volatile oil, besides sugar, gum, and a trace of tannic acid. The so-called Pyrethrin is a mixed substance.

Commerce.—The root is collected chiefly in Algeria and is exported from Oran, and to a smaller extent from Algiers. But from the information we (Flückiger and Hanbury) have received from Colonel Playfair, British Consul-General for Algeria, and from Mr. Wood, British Consul at Tunis, it appears that the greater part is shipped from Tunis, to Leghorn and Egypt. Mr. Wood was informed that the drug is imported from the frontier town of Tebessa in Algeria into the regency of Tunis, to the extent of 500 cantars (50,000 lbs.) per annum. Bombay imported in the year 1871-72, 740 cwts. of this drug, of which more than half was shipped to other ports of India. (Pharmacographia.)

Value, Rs. 24 per maund of 37½ lbs.

Anthemis nobilis, *Linn., Bentl. and Trim., t.* 154, *and several other species.* Chamomile flowers are not generally used in India by the natives; they occasionally come from Persia to Bombay, but at the present time most of those sold in the bazar are European. The Persian name is Bábunah, said to be drived from the name of a village in Irak-Arabi, this the Arabians convert into Bábunaj. Chamomiles are sometimes cultivated in Hindustan in the gardens of wealthy Mahomedans. In Persian works on Materia Medica they are described as stimulant, attenuant and discutient. There is a popular opinion among the Persians that the odour of the flowers induces sleep and drives away noxious insects; they also say that Chamomile tea applied to the genitals has a powerfully stimulating effect. Chamomile is the Anthemis of Dioscorides* and the Anthemon of Theophrastus. It is too well known to require description here.

Chemical composition.—The following is extracted from the Pharmacographia:—"Chamomile flowers yield from 0·6 to 0·8 per cent. of essential oil, which is at first of a pale blue, but becomes yellowish-brown in the course of a few months. At Mitcham, oil of chamomile is usually distilled from the entire plant, after the best flowers have been gathered. The oil has a shade of green, to remove which it is exposed to sunlight; it thus acquires a brownish-yellow colour, at the same time throwing down a considerable deposit.

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* Conf. Dios. iii., 145. The *ανθεμίς* of Dioscorides is referred by Sibthorp to A. chia, *Linn.*, but it is probable that several species were used under this name.

The investigations of several chemists, performed in 1878-79 in Fittig's laboratory, have shown the oil to contain the following constituents:—At 147° to 148° C. isobutylic ethers and hydrocarbons distil, at 177° angelicate of isobutyl, at 200° to 201° angelicate of isamyl, at 204° to 205° tiglinate of isamyl (both these compound ethers answering to the formula $C^5 H^7 O OC^5 H^{11}$). In the residual portion hexylic alcohol, $C^6 H^{13} OH$, and an alcohol of the formula $C^{10} H^{16} O$, are met with, both probably occurring in the form of compound ethers. By decomposing the angelicates and the tiglinate above named with potash, angelic acid, $C^5 H^8 O^2$, and tiglinic (or methylcrotonic) acid, isomeric with the former, are obtained to the extent of about 30 or more per cent. of the crude oil. In the oil examined by Fittig, angelic acid prevailed; from another specimen E. Schmidt (1879) obtained but very little of it, tiglinic acid prevailed.

We have performed some experiments in order to isolate the bitter principle, but have not succeeded in obtaining it in a satisfactory state of purity; it forms a brown extract, apparently a glucoside. We can also confirm the statement that no alkaloid is present." (*Op. cit.*, p. 385.)

Commerce—The Persian chamomiles are the flowers of Matricaria Chamomilla, *Linn.*, *Bentl. and Trim.*, *t.* 155; they are now seldom to be met with in Bombay, the European drug being preferred.

Chrysanthemum coronarium, *Linn.*, *Lam.*, *Ill. t.* 678, *f.* 6. *Syn.*—C. Roxburghii Gul-dáoudí (*Hind.*), Seotí, (*Bomb.*), Shamantippu (*Tam.*), is commonly cultivated in Indian gardens, and is a favourite flower with both Hindus and Mahometans. It blossoms in the cold weather, and there are two distinct varieties, one with large flowers, and another with small, both bearing a very close resemblance to the large and small flowered Chrysanthemums commonly seen in English gardens. The flowers are yellow or white, and when dried impress a peculiar pricking sensation on the tongue like pyrethrum. Dalzell and Gibson (*Bombay Flora* II., 48,) state that they are a tolerable substitute for chamomile. The root chewed communicates the same tingling sensation to the tongue as pellitory. According to Dr. Walker (Bombay Med. and Phys. Trans., 1840, p. 71), the people of the Deccan administer the plant in conjunction with black pepper in gonorrhœa. (Confer. Phar. of India, p. 127.)

Pluchea lanceolata, *Oliv., Deless. Ic. Sel. iv., t.* 21. *Syn.*—Berthelotia lanceolata, *Vern.*—Ra-sana (*Punj.*), Kourasana (*Sind*), is an annual, with spreading branches, and opposite, petioled, oval or oblong leaves covered with stomata on both sides; edges vertical; florets tubular, with silky pappus. It is a native of Sind and the Punjab, forming thickets up to 4 and 5 feet high. The leaves are aperient and are used as a substitute for Senna. (Murray.)

Saussurea Lappa, *Clarke, Dcne. in Jacq. Voy. Bot.* 96, *t.* 104. The root.

Vernacular.—Kút (*Hind.*), Patchak (*Beng.*), Ouplate (*Bomb.*), Goshtam (*Tam.*)

History, Uses, &c.—Costus, in Sanskrit Kushta, is mentioned by Chakradatta, Sarangadhara and in the Bhavaprakása as an aromatic and stimulant, useful in cough, asthma, fever, dyspepsia and skin diseases. It enters into the composition of certain pastiles used for fumigation. This substance was well known to the ancient Greeks and Romans. It is mentioned as a spice by Theophrastus, and occurs in the offering made, B.C. 243, by Seleucus II., King of Syria, and his brother, Antiochus Hierax, to the temple of Apollo at Miletus. (Pharmacographia, p. 467.) The account given of it by Dioscorides is to the effect that Arabian Costus is best; it is of a white colour, and light, and emits a very grateful and sweet odour.* Indian Costus holds the second rank: it is thick and light like ferula. The third sort is the Syrian, which is heavy, in colour like boxwood, and emitting a strong odour. The best Costus is that which is fresh, light coloured, compact, and of firm texture, dry, not worm-eaten, devoid of an acrid smell, and which tastes hot and biting. Arabic and Persian writers follow Dioscorides. In the Tuhfat-el-Muminín it is stated that Kust is a root resembling in appearance that of the mandragora, and comes from the borders of Hindustan. The plant, which yields it is humifuse and stemless, and has broad leaves. There are three sorts: the first, called Arabian or Ocean Kust (Kust-i-Arabí and Kust-i-Bahrí), is sweet, light, white and fragant. The second, called Indian Kust, is of a dirty yellowish colour, light, thick, bitter to the taste, and having but little fragrance. The third is of a dirty red colour and heavy, and in weight (or colour) like boxwood, and fragrant, and without a bitter taste. What follows refers to the first sort, or sweet Kust. The best is what is fresh, white not worm-eaten, and having a hot biting taste. It retains its virtues for four years; and the difference between it and Elecampane (Rásan) or Damascus Kust is in this that Elecampane is harder, and has not the fragrant odour and biting taste of Kust. Kust is hot and dry in the third degree; it is diuretic, revulsive, emmenagogue, hepatic, deobstruent, a universal antidote to animal poisons, attenuates the secretions, a powerful aphrodisiac, vermifuge, lithontriptic, &c.

Mír Muhammad Husain, the author of the Makhzan-el-Adwiya, who wrote in India about one hundred years ago, gives exactly the same account of the drug. (For an account of its history in mediæval Europe, Cooke (Phar. Jour., July 21st, 1877,) and Flückiger (Phar. Jour., Aug. 18th, 1877,) may be consulted. Amongst European writers upon the Materia Medica of India, Ainslie, although he describes Kust as the root of Costus arabicus, expresses his doubts in the following words: "Judging from the root, the plant would appear to differ from that described in the 11th Vol. of the Asiatic Researches, p. 349." The credit of first suggesting the botanical source of the drug is due to Guibourt; his conjectures were afterwards confirmed by Falconer, who, when on a visit to Kashmir, discovered that an Aplotaxis growing there produced the commercial Kust. The plant itself had been previously described by Jacquemont in 1831. Falconer's description may be found in the Transactions of the Linnæan Society (1845, Vol. XIX., p. 23). There is also a full account of the drug and plant, with wood-cuts, in Guibourt's History of Drugs (Vol. III., (1869, p. 32, *et seq.*) Dr. Falconer maintained that the Aplotaxis was the Costus of the ancients, for the following reasons:—

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* Dios. *περὶ κόστου* i., 15.

1*st*—It corresponds with the descriptions of the Costus given by the ancient authors.

2*nd*—Coincidence of names; in Kashmir the root is called Kút and the Arabic synonym is said to be Kust, both given as synonyms by the Persian hakíms, and names by which the medicine is known in all the bazars of Hindustan Proper; in Bengal the Kashmir Kút is called Patchak, and it appears by a note in Dr. Royle's illustrations that Garcia ab Horto gives Pucho as the Malay synonym of Costus arabicus.

3*rd*—Kút is used at the present day for the same purposes in China as Costus was formerly applied to by the Greeks and Romans.

4*th*—The direct testimony of the Persian authors that Kust comes from the borders of India, and that it is not a production of Arabia.

5*th*—The commercial history of the root gathered in Kashmir under the name of Kút.

It is collected in large quantities and exported to the Punjab, whence the larger portion goes down to Bombay, where it is shipped for the Red Sea, the Persian Gulf, and China; a portion of it finds its way across the Sutlej and Jumna into Hindustan Proper, whence it is taken to Calcutta, and bought up there with avidity, under the designation of Patchak, for the China market. Upon these grounds Dr. Falconer held that the plant described by him under the name of Aucklandia was undoubtedly the source of the Costus of the ancients. Royle, who wrote before Falconer's discovery of the source of Kust, appears to have met with two kinds of Costus, Kust-i-talkh and Kust-i-shírín; from his observations on the latter article it would seem to have been the Kust of commerce. (Illustrations, p. 360.) Dr. Royle's original specimen of Kust-i-talkh has also been examined and found to be the root of Aplotaxis. At the present day we meet with only one kind of Costus in commerce. Cooke suggests that Kust-i-shírín is probably the young and Kust-i-talkh the old root, but no distinction of the kind is known in Bombay.*

The author of the Makhzan-el-Adwiya says that Kust-i-talkh is the Phokar-múl of India, which he describes as a black root with numerous fibres and a very bitter and pungent taste. It is said to be aphrodisiacal and tonic, useful in diseases arising from deranged air and phlegm, also in asthma, and for resolving tumours, &c. With regard to the uses of Costus, Dr. Irving states that formerly, when opium was not produced in Rajwarra, this root was extensively smoked as a stimulant. He adds that it is said to be narcotic when thus used, and that formerly great quantities went to China for smoking purposes. At the present time it is chiefly used as a perfume, and to protect bales of cloth from insects. In the Punjab it is applied in powder to ulcers, for worms in wounds, &c., and for toothache; it is also given in rheumatism. A summary of the uses of this drug is given by Baden Powell in his Punjab Products in the the following terms:—

"*1st*—Dried and powdered as the principal ingredient in an astringent stimulant ointment, applied to severe ulcerations.

2nd—Dried and powdered as a hair wash.

3rd—As a stimulant in cholera; an infusion is made of Cardamoms 1 dr.; fresh 'Kut' 3 drs.; Water 4 ozs. One ounce every half hour. It is doubtless a powerful aromatic stimulant, and would be serviceable in any spasmodic disease.

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* Hají Zein el Attar, the author of the Ikhtiárát, considers Kust-i-talkh to be a synonym for Indian Costus.

4th—It is universally employed by the shawl merchants as a protector of Kashmir fabrics from the attacks of moth and other vermin.

5th—The dried root is an agreeable fumigatory, and yields excellent pastilles, which burn fairly.

6th—It is exported in enormous quantities to China, where it is used as an incense. In every hong it is found; no mandarin will give an audience until the 'patchak' incense smokes before him; in every joss-house it smoulders before the Tri-budh deity; in every floating junk in the Chinese rivers, the only house of countless hordes, Budh's image is found, and the smoke of the Patchak religiously wends its way heavenward. As to its uses in China, Dr. Porter Smith says that it is used in making incense in the South, or to preserve clothes from the attacks of moths and other insects. It is said to have the power of turning grey hair black. Carminative, stimulant, antiseptic, prophylactic, astringent, sedative, and insecticidal properties are referred to this remedy. The Chinese apply it with musk, which it resembles in odour and properties, to aching teeth."

Description.—Costus or Ouplate occurs in crooked twisted pieces about 3 inches long, and from ½ to 1½ inch in diameter, almost always split. Externally it is brown, marked by longitudinal ridges, and has a rough and somewhat reticulated surface. Its substance is compact and brittle, the fractured surface having a resinous appearance and dirty white colour. The central portion is generally absent, and appears to have been removed by decay before the root was collected. The taste is bitter, pungent and camphoraceous; the odour resembles that of fresh violets or orris root.

Microscopic structure.—Flückiger in his pamphlet, "Die Frankfurter Liste," Halle, 1873, p. 25, has shown that the root abounds in inulin, and shows, especially in the bark of the branches of the root, large balsam ducts. In both these respects Costus root agrees well with Elecampane and other aromatic roots of the Compositæ. A microscopic examination shows that the root consists of two parts, *viz.*, a thick cortic layer of close texture, pervaded by a few laticiferous ducts and an inner radiating portion, the parenchyma of which is not so dense. This is also provided with laticiferous ducts, and a very abundant scalariform vascular system, which appears to be loaded with resinous matter. I have not been able to detect any starch, nor does the iodine test indicate its presence.

Adulteration.—The Kashmiris say that this drug is apt to be adulterated with five or six other kinds of roots. Sir G. Birdwood remarks that the root of a plant with the native name of poshkar (phokar ?), believed to be a species of Ligularia, is used for adulterating Kút, and the Kashmiris at Lahore make the same statement. A sample of false Costus in the Indian Museum, under the name of Kút mitha, examined by Cooke, was found to consist of pieces of a cylindrical root from 1 to 3 inches in length and from ½ to 1½ inch in thickness; externally it was nearly smooth, or longitudinally striate with transverse paler scars. It was much lighter and less compact than Costus, friable and farinaceous internally, very much subject to attacks from insects, with little or no apparent odour or taste, and containing a large quantity of starch, the granules of which were variable in size, and attached to each other in twos and threes. In 1859, a communication was made to the Agri-Horticultural Society of India of two roots, one called Kút and other Thúth. They were from the hills of that part of the Kangra district which borders on Chumba. The "Kút" was identified as the "Costus," and the other was believed by Dr. Thompson to be the root of Salvia lanata, which was said to be common also in Kashmir, where it is used to adulterate "Kut." Subsequently Mr. H. Cope of Umritsar contributed some remarks to the same Society on the adulterations of this drug. "This adulteration," he says, "is now (1860) carried to such a pitch with the assistance not only of the tút (which so closely resembles the genuine article in every respect but its qualities, that it is difficult to distinguish the one from the other after admixture, which imparts to the false the odour of the true drug), but with other foreign substances of which cowdung is one, that I have ascertained as a fact that the more unscrupulous dealers use some 20 seers of the Kút to flavour 100 seers of trash. When tút was first found useful as an admixture, it was sold at Re. 1½ per maund; being now the main ingredient of the Patchak of commerce, it has risen to Rs. 4½. I am told that two other substances, resembling the genuine article in exterior appearance, have been ascertained to serve as ingredients in the mixture sent to Calcutta and Bombay for exportation to China under the name of Patchak. They are, a root called Chog, brought from the hills, which is generally reported to be a deleterious drug, and Nirbisí, the root of a species of Aconitum, probably a virulent poison." (Cooke in Phar. Jour., July 21st, 1877.) With regard to Mr. Cope's remarks, I may mention that there is no difficulty in obtaining genuine parcels of Costus in Bombay. Perhaps the adulterated article may be specially prepared for the China market.

Chemical composition.—Costus contains much inulin, but no chemical examination of the drug appears to have been made.

Commerce.—The roots are dug up in the months of September and October, when the plant begins to be torpid; they are chopped up into pieces from 2 to 6 inches long, and exported without further preparation. The quantity collected is very large, amounting, as far as Dr. Falconer could learn, to 10,000 or 12,000 khurwars (192 lbs.) The commodity is laden on bullocks, and exported to the Punjab, whence it finds its way to Bombay, and a portion to Calcutta through India. In Dr. Falconer's time the cost of collection and transport was about half a crown per cwt. Cleghorn states that it is also exported from Pangi on the Upper Chenab to the plains. The loads of it when passing, scent the air to some distance. Davies' "Trade Report" gives 20 maunds as exported to Afghanistan *viá* the Bolan. Royle mentions that in one year (1837-38) 6,697 maunds of this root, valued at Rs. 99,000, were exported from Calcutta to China, and in 1867-68 nearly 10,000 maunds. In Kashmir the Maharaja is said to take it over from the collectors at half the price at which it sells again. In 1864, his income from this source was put down on good authority (according to Dr. Stewart) at 300,000 chilki, equal to nearly 1,90,000 rupees; but this, he adds, is scarcely credible. Kút is imported into Leh in small quantities from Kashmir for exportation to Lhassa, where it is called, as well as by the Bhotes, Rusta, and is used for incense. In 1871, 33 maunds were imported into Leh from Kashmir, valued at Rs. 692. According to Dr. Falconer, at the time he wrote, the cost of collection and transport to a depôt at Kashmir was 2*s.* 4*d.* per cwt.; on entering India its value was enhanced to from 16*s.* 9*d.* to 23*s.* 9*d.* per cwt., whilst the commercial value at Canton was 47*s.* 5*d.* per cwt. From the Consular reports we find that in the year 1875 the imports of Costus into two Chinese ports only were for Hankow 1,270 piculs, valued at £5,224 6*s.* 3d., and Cheefoo 277 piculs, valued at £1,197, so that it is clearly no insignificant article of Chinese commerce. (Cooke in Phar. Jour., July 21st, 1877.) The value of Costus in Bombay averages Rs. 9 per maund of 37½ lbs.

Centaurea Behen, *Linn.* The root.

Vernacular.—Suffed Bahman (*Hind.* and *Bomb.*)

History, Uses, &c.—This root is the White Behen and White Rhapontic of old writers, the Bahman abiad of the Arabians, and the Bahman-i-suffed of the Persians. It is an annual plant which abounds in the mountainous districts of Syria, Armenia and Khorasan, having lyre-shaped radical leaves and opposite lobes, the stem leaves amplexicaul, roots the thickness of the finger, rugose and grey externally, white within, with an agreeable aromatic odour, and glutinous slighty stiptic taste. It is much used by Mahometan physicians, who consider it to be hot and dry in the second degree, and a powerful aphrodisiac and resolvent of phlegmatic humours; they also prescribe it in calculous affections and jaundice. Ainslie confounds it with Asgand,* and also with the root of Physalis somnifera. (Confer.

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* He was probably misled by the Tuhfat which gives Asgand as the Hindi for White Bahman.

Mat. Ind. II., 14.) White and red Bahman are drugs of the ancient Persians, through whom the Arabs became acquainted with them, and introduced them into the West. From the Burhán-i-Kátia we learn that the word Bahman is equivalent to Brahman, and means the supreme intelligence; it is also the name of one of the Persian months, of the second day of each month, and of a plant which flowers in the month Bahman (January). Of this plant there are two varieties, red and white, the roots of which are fattening, expel flatulence, and are aphrodisiacal. On the second day of the month Bahman, when the name of the day and month are the same, the Persians celebrate a feast, and cook all kinds of corn and meat, and sprinkle the flowers of the red and white Bahman upon the food; they also make a flour of the two roots and eat it with sugar, and the white Bahman they powder and drink with milk to strengthen the memory. This day, which is called the Bahmanjana, is considered to be a propitious day for collecting medicinal herbs, commencing any undertaking, putting on new clothes, paring the nails, cutting the hair, &c.

Description.—Red Bahman is a tuberous root, consisting of a central portion about 2 inches in diameter, from which spring 5 or 6 tapering tubers from 1½ to 2 inches long, and from ½ to 1 inch in diameter at the base. At the top of the central tuber is a scaly crown about 1 inch in diameter. The external surface of the root is of a reddish-brown colour, scabrous and marked by numerous circular and longitudinal wrinkles; internally there is a dull red woody central portion, surrounded by a thick, yellowish-white horny layer, which near the crown becomes spongy. In the commercial article the root is sliced and the central woody part removed. A section of the lateral tubers shows a red woody core, from which radiate rows of red spots as far as the inner bark. The spots when magnified are seen to consist of bundles of scalariform vessels, surrounded by a collection of pigment cells; the medullary rays connect these bundles, and are composed of single rows of oblong cells filled with finely granular red pigment. The bulk of the tuber consists of transparent cells which contain no starch.

The bark is composed of an outer layer of epidermal scales, a middle layer of tangentially extended cells loaded with red pigment, and an inner layer of closely-packed columns of cells containing finely granular matter, and sometimes red pigment. The root has a mucilaginous and somewhat astringent taste. In general appearance and minute structure it closely resembles the Pœony, and it is worthy of note that an edible Pœony (P. albiflora, *Pall.*) is known to grow in Central Asia. The author of the Makhzan says that the plant which produces Red Behen is called by some Kaf-i-Adam.

White Bahman.—The dry root is of a whitish-brown externally, much shrivelled and twisted; near the crown it is marked by numerous circular lines. It may be either simple and tapering, or more or less branched; sometimes a portion of purplish stem remains attached; the average length is about 2½ inches, diameter ¾ of an inch; the interior is white and spongy; when soaked in water it swells and becomes mucilaginous. The taste is mucilaginous and slightly bitter.

Microscopic examination shows that the root contains no starch. There are numerous large bundles of spiral vessels.

Chemical composition.—Behen does not appear to have been examined, but it doubtless contains abundance of inulin.

Commerce.—It is imported into Bombay from the Persian Gulf in considerable quantities, and is always to be found in the shops. Value, Rs. 6½ per maund of 37½ lbs.

Xanthium Strumarium, *Linn.*, *Eng. Bot.* 2544.

Vernacular—Shankeshvara (*Bomb.*) The whole plant is supposed to possess powerful diaphoretic and sedative properties. It is generally administered in the form of decoction, and is said to be very efficacious in long standing cases of malarious fever. (S. Arjun.) In America and Australia this plant has been observed to prove fatal to cattle and pigs.

Description.—Stem erect, scabrous, clouded with dark coloured spots; leaves alternate, petioled, cordate or kidney-shaped, notched, waved, 3-nerved, scabrous, about 4 inches in diameter, petioles round, scabrous, as long as the leaves; flowers terminal and from the superior axils, male aggregate above the female, short peduncled; female, subsessile, solitary; germ superior, oblong, armed with uncinate bristles, 2-celled, each cell containing one ovule enveloped in an interior tunic.

In the Punjab and in Sind it is called Gokhrú Kallán, and is given in small-pox on the doctrine of signatures. Its hairs and prickles are employed as medicine in China. (Stewart, Smith.) The Ξάνθιον ἤ φασγάνον of the Greeks and garden Hasak of Arabian writers was probably this plant.

Chemical composition.—Zander (1881) obtained from 100 parts of the fruit 5·2 ash, 38·6 fat, 36·6 albumenoids, 1·3 xanthostrumarin and organic acids, besides sugar, resin, &c. Xanthostrumarin seems to be a glucoside, is yellow, amorphous, soluble in water, alcohol, ether, benzol and chloroform, and yields precipitates with group reagents for alkaloids, and with ferric chloride, lead acetate, and salts of other metals, but is not precipitated by tannin or gelatin. M. V. Cheatham (1884) obtained only 14·5 per cent. of fixed oil, and a principle which was precipitated by tannin. (Amer. Journ. Pharm, 1881, 271, and 1884, 134.)

Lactuca sativa, *Linn.*, *Reichb. Ic. Fl. Germ.*, *t.* 1421. The seeds.

Vernacular.—Káhú (*Hind.*, *Beng.* and *Bomb.*), Shallattuvirai (*Tam.*)

History, Uses, &c.—Lettuces have always been greatly esteemed on account of their cooling and refreshing properties. In the wild state they produce to a certain extent narcotic and sedative effects, but these appear to be almost entirely removed by cultivation; still, even in the cultivated varieties, a milky and bitter juice exists in the flower stem. Lettuces (θρίδαξ) appear to have been used for salads at a very early period. According to Herodotus, they were served at the tables of the

Persian kings more than 400 years before the Christian era. The opium of Galen is supposed to have been Lettuce opium. The seeds are one of the four lesser cold seeds of old writers, and as such still retain their position in the Materia Medica of the East. Mír Muhammad Hussain in his Makhzan mentions several kinds of lettuce, and also lettuce opium, but he acknowledges the superiority of the lettuces raised from English seed in India over those of Persia, and enlarges upon the cooling and purifying action of the herb upon the blood. The lettuce seed found in India is white; it is imported from Persia, and is sold for Re. ¼ per lb.

The Arabic name is Bazr-el-khas and the Persian Tukm-i-káhú. Both plant and seed are too well known to require description.

Harshaf (*Arab*), Kangar (*Pers.*) Persian writers describe two kinds of wild artichoke, and a cultivated variety; the wild artichokes are described as being covered with a clammy substance called Kangar-zad (کنگرژد) or Artichoke gum; they are considered to be aphrodisiac diuretic and tonic. The gum is used as an emetic, being administered dissolved in warm water and oxymel; applied externally it is supposed to be resolvent. Kangar-zad is a yellowish viscid substance much mixed with impurities (parts of the plant), and is imported into Bombay from Persia. Cynara scolymus appears to have been the Harshaf of the early Arabian writers, and is the Enghinar of the Turks. Its leaves and stems have long been in use in Italy and Germany as a remedy for rheumatism; the fresh juice has also been employed in scurvy, dropsy and chronic jaundice. Dr. Montain of Lyons has brought forward *Cynarin* the active principle as a febrifuge. The spirituous extract of the leaves has the appearance and taste of Aloes, and contains Cynarin, a substance analogous to Aloin. A decoction of Artichoke in white wine has also been employed in Europe in intermittent fevers. (Dorvault.) A further examination of the substance named

Cynarin is desirable; it should also be ascertained whether the Artichoke gum of Persia contains anything analogous to it.

Cichorium Intybus, var. endivia, *Linn.* The seed and root.

Vernacular.—Kásni (*Hind., Bomb.* and *Beng.*), Kashini-virai (*Tam.*)

History, Uses, &c.—The Endive is generally considered to be a native of Persia, Northern India, China and perhaps Egypt. Be this as it may, there is no doubt of its having been used as an esculent from a very early period by the Egyptians, through whom the Greeks and Romans probably became acquainted with it. It is the σέρις of Dioscorides,* and the intubus or intybus of the Romans. The Arabs call it Hindyba, evidently a corruption of Intyba, and the Persians Kásni, a name which is current all over India, proving the introduction of the plant from the West. Mahometan writers mention several varieties of Endive, which are probably the same as those known to us. The Persian seed which I have planted produces a hairy variety, with upright leaves. The same kind is cultivated by the natives in the neighbourhood of Hyderabad Deccan.

Endive is much valued by the hakíms as a resolvent and cooling medicine, and is prescribed in bilious complaints much as Taraxacum is with us. The seeds are one of the four lesser cold seeds of old writers, and as such are still in use in the East. Both plant and seeds are too well known to require description.

Launœa pinnatifida, *Cass., Wight Ill., t.* 133.

Syn.—Microrhynchus sarmentosus.

Vern.—Pathri (*Bomb.*) This plant, which is common in sandy soil, is much used at Goa as a substitute for Taraxacum. The Goanese call it Almirao. Dalzell and Gibson in their

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* Dios. ii., 121.

Bombay Flora, p. 135, have the following botanical description :—" Stem filiform, procumbent, bearing roots and leaves here and there ; leaves crowded sinuate-pinnatifid, lobes obtuse or subacute; peduncles rather shorter than the leaf, having at the top scaly bracts which are scarious on the margin." The roots are fleshy, about the size of a crowquill, and 6 to 8 inches long; when fresh they are yellowish-white. A section shows a yellow central fibro-vascular column, containing very large fenestrated vessels arranged in a radiating manner. Beyond the radii the parenchyma is loaded with large colourless bodies of irregular size and shape, which gradually diminish in number towards the cortex, where the parenchyma is not occupied by them. The cellular structure is delicate and the cells large. These bodies appear to be cells distended by some solid nearly transparent matter (inulin ?) as they correspond in form and position with neighbouring empty cells. In Bombay Pathri is given to buffaloes to promote the secretion of milk. Murray refers the Ban-káhú of Sind to this plant, but his description hardly agrees with it. He says the juice of the Ban-káhú, called *Khee-khowa,* is used as a soporific for children in doses of half a massa, and is externally applied in rheumatic affections combined with the oil of Pongamia glabra or the juice of the leaves of Vitex leucoxylon.

Lactuca remotiflora, *D. C., Jaub. and Spach. Ill. Pl. Orient., t.* 281. The whole plant is used as a substitute for Taraxacum at Goa, and is called by the Portuguese Taraxaco. Its Mahratta name in Goa is Undira-cha-kán, which means *rat's ear;* Dalzell and Gibson describe the herb as glabrous, stem erect, leafy at the base, naked at the top, sparingly branched; leaves membranaceous, stem-clasping, obovate, somewhat runcinate and waved, bristle-ciliated on the margins; capitula remotely spicato-racemose; pedicels a little scaly, short; achenia oblong, subcompressed, transversely muricated, attenuated into a short beak; pappus white, soft. (*Bombay Flora,* p. 132.)

Notonia grandiflora, *D. C., Deless. Ic. Sel. iv., t.* 61; *Wight Ic., t.* 484. *Syn.*—Cacalia Kleinia, Herb. Madras. The *Wânder-roti* of the Mahrattas, was named by De Candolle after Mr. Benjamin Noton of Bombay, who first met with it on the Neilgherries; it is also found upon high rocky precipices in the Deccan. In 1860, Dr. A. Gibson brought forward this plant as a preventive of hydrophobia. The mode of administration is as follows: about four ounces of the freshly-gathered stems, infused in a pint of cold water for a night yield in the morning, when pressed, a quantity of viscid greenish juice, which being mixed with the water, is taken at a draught. In the evening a further quantity of the juice, made up into boluses with flour, is taken. These medicines are directed to be repeated for three successive days. The Editor of the Pharmacopœia of India says that from official documents placed at his disposal, it appears that the remedy has been tried in numerous cases; but as at the time of the infliction of the wound, caustic was applied locally in the majority of cases, it is difficult to determine how far the Notonia operated, if at all, as a prophylactic. (Phar. of India, p. 126.)

An extract of the herb was tried by the late Dr. Haines and myself on dogs, and afterwards at the European Hospital in Bombay (1864). In one drachm doses it had a feebly aperient action; no other effect was observed. The dried plant was for a time issued to medical officers in Government employ, but no further information as to its properties would appear to have been obtained. N. grandiflora is a shrub, fleshy, smooth; stem thick, round, marked with the scars of fallen leaves; leaves oblong or ovate, entire; flowers terminal, corymbose, few, pale yellow. The dry stems, which are white, soft and fragile, yield an abundant greenish extract.

Carthamus tinctorius, *Linn., Reicbh. Ic. Fl. Germ., t.* 746. The flowers and fruit.

Vernacular.—Kar, Kusumbah (*Hind.*), Kusumbah (*Bomb.*), Kushumbá (*Tam.*), Kusum (*Beng.*)

History, Uses, &c.—This plant is the Kusumbha of Sanskrit writers, who describe the seeds as purgative, and mention a medicated oil which is prepared from the plant for external application in rheumatism and paralysis. It is the κνίκος of the Greeks,* who used the leaves like rennet to curdle milk in making cheese. Pliny calls it Cnicus.† Mahometan writers enumerate a great many diseases in which the seeds may be used as a laxative; they consider them to have the power of removing phlegmatic and adust humours from the system.

The author of the Makhzan tells us that Kurtum, Hab-el-asfar, and Bazr-el-ahris are the Arabic names for the seeds, and Khasakdanah and Tukm-i-kafshah the Persian. He also says that in Ghilan they are called Tukm-i-kájrah or Tukm-i-kazírah, in Syria Káshni, and in Turkey Kantawáras, and that the Greeks call them Atraktus, and Dioscorides Knifus (κνίκος). Ainslie has the following notice of the plant:—"A fixed oil is prepared from it which the Vytians use as an external application in rheumatic pains and paralytic affections, also for bad ulcers; the small seeds are reckoned amongst their laxative medicines, for which purpose I see they are also used in Jamaica (the kernels beat into an emulsion with honeyed water). Barham tells us that a drachm of the dried flowers taken cures the jaundice." (Hort. Jamaica, I., 72.) In Bombay the seeds under the name of Kardayí are pressed along with ground-nuts and sesamum to form the sweet oil of the bazars; they are also universally kept by the druggists for medicinal use. Under the name of safflower the flowers form an important export article to Europe; they contain two colouring matters, yellow and red, the latter is the most valuable. In silk dyeing it affords various shades of pink, rose, crimson and scarlet. Rouge is also made from it.

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* Dios. iv., 182; Theoph. H. P. vi., 1. Arist. H. A. v., 19.

† 21, 15.

Description.—The Carthamus grows about two or three feet high, with a stiff upright whitish stem, branching near the top; and has oval, spiny, sharp-pointed leaves, their bases half clasping the stem; the flowers grow in heads at the end of the branches, and are surrounded by numerous leafy bracts (involucre) in numerous rows, the outermost row being broad and spreading out flat, with their edges spiny, the middle ones more upright, of an oval form, and surmounted by an egg-shaped appendage with spiny edges, and the innermost much narrower, quite upright, with their edges entire, but terminated by a sharp spiny point. Each flower is perfect, and has an orange or yellow corolla longer than the involucre, their lower part being imbedded in a dense mass of fringed scales and hairs, but the chief characteristic consists in the absence of the bristles, technically termed pappus. The fruits are about the size of barley corns, somewhat 4-sided, white, and shining like little shells. (A. Smith in Treasury of Botany.)

Chemical composition.—The flowers of Carthamus tinctorius contain two coloured principles, one yellow, soluble in water, and of no use in dyeing; the other red, soluble in alkalis, and precipitable by acids from its alkaline solutions; this is Carthamin. To prepare it, safflower is first washed repeatedly with water, to free it from the yellow susbtance, then treated with solution of carbonate of sodium; the liquid is saturated with acetic acid, and pieces of cotton are immersed in it, on which the Carthamin is deposited. After twenty-four hours the cotton is removed and treated with solution of carbonate of sodium, which redissolves the colouring matter; the solution is mixed with citric acid, whereby the Carthamin is precipitated in red flocks, and lastly these flocks are dissolved in alcohol. The solution evaporated in vacuo yields the Carthamin in the form of a powder, having a deep red colour with greenish iridescence. It is sparingly soluble in water, insoluble in ether, but easily soluble in alcohol, yielding a fine purple solution.

According to Schlieper, Carthamin contains 56·9 per cent. carbon and 5·6 hydrogen, agreeing with the formula $C^{14}H^{16}O$.

The yellow colouring matter of Carthamus is acid. It has a bitter taste and great colouring power. It combines readily with oxygen, and is converted into a brown substance. It unites with oxide of lead, forming the compound $(Pb^{2}O)^{3}C^{8}H^{10}O^{5}$.

Commerce.—Kusumbah is cultivated in most parts of India; it is exported from Bombay in large quantities. Value, Rs. 10 per maund of 37½ lbs.

The seed Kardyí is of considerable importance as an oil seed in India. Value, Rs. 16 per candy of 8 pharrahs (5 cwts. about).

Tagetes erecta, *Linn.*, *Bot. Mag.*, *t.* 150.

Vernacular.—Makhmal, Gul-Jáfari (*Bomb.*)

The French Marygold is quite naturalized in India. One tolá of the juice of the petals heated with an equal quantity of ghi is given daily for three days as a remedy for bleeding piles. The flowers are considered to have a purifying action upon the blood.

Carduus nutans, *Linn.*, *Reichb. Ic. Fl. Germ.*, *t.* 146.
Vernacular.—Kancharí (*Sind*). The flowers are employed as a febrifuge both in Sind and in the Punjab.

Volutarella divaricata, *Benth.*, *Wight. Ic.*, *t.* 1139. The plant.

Syn.—Tricholepis procumbens.

Vernacular.—Bádáward (*Pers.* and *Bomb.*)

This drug is described by Mahometan writers as the Shaukat-el-baida of the Arabs, the Lúfiniki of the Turks, and the Sanakhurd of the Syrians. Other Persian names given for it are Kangar-i-sufed and Asfar-i-barí. It is generally described as a thorny plant about two cubits high with downy triangular stems as thick as the thumb or larger; heads of seed like those of a thistle, thorny and full of down; flowers purple, seeds like those of carthamus, but rounder. M. M. Husain says :—"Some have supposed this plant to be the same as the Shukai; this is not the case, but the two plants are nearly related. The true Bádáward has slender, white round stems, little more than a span high, slightly downy; flower heads white, surrounding them are three delicate soft spines like needles, so that all together they have much the appearance of a brooch, within is a quantity of white down, which, when the seeds are ripe, causes them to be carried about by the wind, hence the name Bádáward. Medicinally the plant has tonic, aperient and deobstruent properties. It is said to drive away noxious reptiles when kept in the house." (Makhzan, article Bádáward.)

The Bádáward of Bombay agrees with the description of Mír Muhammad Husain. V. divaricata is found on sandy ground in Guzerat, and is thus described in the *Bombay Flora* :—"Stem flexuose, short, ramous; branches diffuse, procumbent, angularly striated, subglabrous, leaves shortly pubescent or subglabrous, those of the stem lyrate, of the branches sinuately pinnatifid, the lobes spinously mucronate, involucre ovate, scales ovate at the base, araneose, terminating in a prickle-like appendage, flowers purple, appear in the cold weather, common in light soils in Guzerat." The drug has a bitter taste; it is imported from Persia.

Tricholepis glaberrima, *D. C., Dcne in Jacq. Voy. Bot.* 98, *t.* 106, *Vern.*—Bramhadandi, is believed by the natives to be a nervine tonic and aphrodisiac. It is a tall, erect, smooth plant, stem angled, leaves linear-lanceolate, acuminate, stem-clasping, distantly spotted with black specks, florets 7 lines long, heads of flowers small, terminal, purple.

Dicoma tomentosa, *Cass.*, *Wight Ic.*, *t.* 1140. *Vern.*—Navananji-cha-pála (*Belgaum*). An erect much-branched annual, 10 to 18 inches high, clothed with white cottony wool; leaves sessile linear or linear-obovate, obtuse or acute, quite entire, cottony, 1 to 3 inches long; heads sub-axillary, involucre bracts, ½ to ⅔ in. subulate, spinescent, straight, glabrous, shining; achenes broad and short, ⅛ in. long, turbinate, densely silky; pappus shining, elastic, brush-like. The herb is strongly bitter, and is used in the neighbourhood of Belgaum as a febrifuge, especially in the febrile attacks to which women are subject after childbirth. Dr. Peters, of the Bombay Medical Service, first brought to notice the use of this plant medicinally by the natives.

LOBELIACEÆ.

Lobelia nicotianæfolia, *Heyne*, *Wight Ill.*, *t.* 135. The plant.

Vernacular.—Deonal, Bokenal, Dhaval.

History, Uses, &c.—This Lobelia was first described by Heyne, who found it near Bangalore. It is found upon the mountain ranges of Ceylon and Southern and Western India. Graham (Bombay Plants) tells us that the dried stalks, which are hollow in the centre, are sold in the bazar at Mahableshwar, and used as Koluri horns* for collecting herds of cattle and scaring wolves. According to Dr. Gibson, the Mahratta name, Deonal, is probably given to the plant in allusion to its uses as a reed for incantations. Hardly anything appears to be known of its medicinal properties. In the Pharmacopœia of India an infusion of the leaves is said to be used as an antispasmodic. The dry herb when handled is extremely acrid, the dust irritating the throat and nostrils like tobacco. The native name, Bokenal, or tubular poison plant, would lead one to infer that the plant is poisonous, but I am not aware that this has ever been proved. I have met with no mention of the plant in native medicinal works.

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* Called पांवा in the Concan.

Description.—The leaves resemble those of the tobacco; they are finely serrated and covered with simple hairs. The lower part of the stem is woody, an inch and a half or more in diameter, and almost solid; the upper portion is a hollow tube ending in a crowded head of flower spikes; the latter are about a foot in length, and when the plant is in fruit, are thickly set with globular capsules about the size of a pea, to which a portion of the dry flower is often adherent; the capsules are two-celled, each cell containing a fleshy placenta. The seeds are numerous and very small (1-50th of an inch in length), oval, flattened, and marked with delicate lines. Several small tubercles surround the site of the placental attachment; their colour is light brown. The whole plant when dry is studded with small spots of resinous exudation, and is hot and acrid to the taste.

Chemical composition.—I am not aware of any chemical examination of the plant having been attempted. Six ounces of the dry herb yielded to rectified spirit half an ounce of dark brown resinous extract.

ERICACEÆ.

Gualtheria fragrantissima, *Wall.* The essential oil.

Vern. (?) Indian Winter green.

This shrub grows abundantly on the mountains of Burmah, Southern India and Ceylon, and affords an essential oil nearly identical with that of Gualtheria procumbens, *Canadian Winter Green.* Mr. Broughton, the late Government Quinologist at the Neilgherries, in a report to the Madras Government on the subject of this oil, says:—"The oil from this source contains less of the peculiar hydrocarbon which forms a natural and considerable admixture with the Canadian oil, and therefore is somewhat superior in quality to the latter. The commercial demand for the oil is not, however, considerable enough to make its occurrence in India of much direct importance.

"It occurred to me in 1869 that methyl-salicylic acid would, however, under suitable treatment, furnish carbolic acid according to a decomposition described by Gerhardt. After a few experiments I was successful in preparing considerable quantities of pure carbolic acid. The method of manufacture is as follows:—The oil is heated with a dilute solution of caustic alkali, by which means it is saponified and dissolved, methylic alcohol of great purity being liberated. The solution of the oil is then decomposed by any mineral acid, when beautiful crystals of salicylic acid are formed. These are gathered, squeezed, and dried. They are then mixed with common quicklime or sand, and distilled in an iron retort; carbolic acid of great purity, and crystallizing with the greatest readiness, passes into the receiver. This acid is equal to the purest kind obtained from coal tar, and employed in medicine. It, of course, possesses all the qualities which have rendered this substance almost indispensable in modern medical and surgical practice. I had hoped, from the inexhaustible abundance with which the plant grows on the Neilgherries, that the carbolic acid from this source could be prepared at less cost than that imported. I have not yet had an opportunity of working on a large scale with an itinerant still, as would be necessary for its cheapest production; but from some calculations I have lately made, I am led to think it can scarcely be prepared for less than the price of that procured from coal-tar. The purest kinds from the latter source cost four shillings a pound; I estimate the cost of that from this indigenous source at from Rs. 2-8 to Rs. 3-8 per pound in this country. The carbolic acid from the same source has certain advantages over the coal-tar acid, consequent on its extreme purity. It is less deliquescent, and cannot possibly be open to the suspicion of contamination with certain other products of coal-tar which possess injurious qualities.

"In conclusion I am led to the belief that it would not be advisable to prepare carbolic acid from this singular source, when the comparative cost shows that the gain must be very small or non-existent. But it appears to me well worthy of record, that should circumstances render the supply of the English product difficult or uncertain, as in the case of war, or the English price increase, a practically inexhaustible source exists in this country from which this indispensable substance, in its purest state, can be obtained at a slight enhancement of the present price." (Confer. Pharm. Journ., Oct. 1871.)

MYRSINACEÆ.

Embelia ribes, *Burm. Fl. Ind.* 62, *t.* 23; *Lam. Ill., t.* 133. The berries.

Vernacular.—Babarang (*Hind.* and *Beng.*), Vaivarang (*Bomb.*), Váyu-vilangam (*Tam.*)

History, Uses, &c.—The Sanskrit name is Vidanga. Susruta describes the fruit as anthelmintic, alterative and tonic, and recommends their use along with liquorice root for the purpose of strengthening the body and preventing the effects of age. Later writers regard Babarang as carminative, stomachic, anthelmintic, and useful against intestinal worms, dyspepsia, and skin diseases. The berries enter into the composition of several applications for ringworm and other skin diseases. (Confer. Dutt's Hindu Mat. Med., p. 187.) Under the names of Birang-i-Kabulí and Biranj-i-Kabulí notices of the drug will be found in Mahometan works. The hakíms consider it to be attenuant and a purgative of phlegmatic humours; also a valuable anthelmintic, especially against tapeworms. Ibn Sina describes it as a strong anthelmintic. Mír Muhammad Husain notices that it turns the urine red. He fixes the dose at three dirhems of the powder, and directs it to be given with fresh milk. Ainslie has the following short notice of it:—" Babreng is the Hindooie name of a vermifuge seed, common, I have been given to understand, in the higher provinces of Bengal, the Sanskrit name of which is Chitratandoola. What the plant is

I know not." Roxburgh gives a full botanical description of the tree, and remarks that the berries are used to adulterate pepper. Royle notices their aperient properties. Vaivarang is common in the neighbourhood of Bombay, and is in high repute as an anthelmintic among the country people, especially in cases of tapeworm, a disorder common among the Native Christians of the Western Coast. The dose is a teaspoonful of the powder twice a day for a child, and a dessert spoonful for an adult; it can hardly be called purgative; the taste is rather pleasant, slightly astringent, and faintly aromatic. The worm is expelled dead. A purgative should be given to prepare the patient for the drug. It is a common practice to put a few berries of this plant in the milk that is given to young children; they are supposed to prevent flatulence.

Description.—The fruit is globular, of a dull red, and grows in large bunches; it is rather smaller than a pepper corn. The drug has the five partite calyx and stalk often attached; the outer shell is striated from the base to the apex, where there is a small beak; its colour is reddish brown marked with dark spots, inside the outer shell is the seed, enveloped in a delicate membrane, on removing which a cup-like hollow is seen opposite the insertion of the stalk. The seed is horny, of a reddish colour, and its external surface appears to be covered with spots of white mildew : this appearance however, with the aid of a lens, is seen to be due to a delicate crystalline efflorescence. If kept for any time the outer shell of the fruit becomes much darker. From the rapidity with which this change takes place, I should suppose the quality of the drug to be not affected by it.

Commerce.—Value, Rs. 2½ per maund of 37½ lbs. A large quantity of the fruit is collected in the immediate neighbourhood of Bombay. Lately it has been exported to Germany.

OLEACEÆ.

Nyctanthes arbor tristis, *Linn., Bot. Reg., t.* 399; *Lam. Ill., t.* 6; *Bedd. Fl. Sylv., t.* 240; *Gärtn. Fruct. ii., t.* 138. Flowers, leaves, and fruit.

Vernacular.—Harsinghar (*Hind.*), Siuli (*Beng.*), Pártak (*Bomb.*), Pagala-mullai (*Tam.*)

History, Uses, &c.—Royle in his Himalayan Botany tells us that this tree is extremely common along the foot of the mountains which skirt the Dehra Dhoon, and may be seen for several hundred feet above Rajpore in the ascent to Mussooree. Dr. Wallich found it in a wild state near the banks of the Irrawaddy, on the hills near Prome. In Western India it is one of the commonest cultivated trees, its flowers open at sunset, and fall before morning; they have a very strong perfume. The Sanskrit names for the tree are Sephalika, Párajátak, and Rájanikasa. The author of the Makhzan gives a minute description of all parts of the tree, and tells us that the Indians use the white portion of the flowers as a purple dye, which they call Gulkámah, and the orange part as a yellow dye. The seeds and leaves are considered by them to have medicinal properties. Six or seven of the young leaves are rubbed up with water and a little fresh ginger, and administered in obstinate fevers of the intermittent type, at the same time a purely vegetable diet is enforced. The powdered seeds are used to cure scurfy affections of the scalp. Directions for the preparations of Gulkámah will be found in the Karabádín-i-kabir. Chakradatta mentions the use of the leaves in fever and rheumatism; a decoction of the leaves prepared over a gentle fire is recommended by several writers as a specific for obstinate sciatica. (Confer. Dutt's Hindu Mat. Med., p. 189.) In the Concan about 5 grains of the bark are eaten with Betel nut and leaf to promote the expectoration of thick phlegm.

Description.—Tree, 15 to 20 feet, young shoots, 4-sided, leaves opposite, short-petioled, cordate or oblong, pointed entire, or coarsely serrate, scabrous; panicles terminal, composed of smaller six-flowered terminal umbellets, calyx campanulate, slightly 5-notched, downy; corolla tube cylindric, as long as the calyx, segments 5 to 7; involucel of four inverse-cordate, opposite, sessile leaflets; flowers numerous, tube orange-coloured, border white, fragrant. The fruit is a dry, flat oblong, mucronate capsule, prominently veined, $\frac{3}{4}$ inch long by $\frac{1}{2}$ inch broad; it is of a brown colour when ripe, and is divided into two cells, each of which contains a flat foliaceous seed of a light brown colour; the testa of the seed is thin, the kernel white, bitter and very astringent. The leaves have similar properties, and stain the saliva yellow when chewed.

Jasminum grandiflorum, *Linn.*, *Bot. Reg.*, *t.* 91; *Wight Ic.*, *t.* 1257; *Rheede Hort. Mal. vi.*, *t.* 52. The leaves and flowers.

Vernacular.—Chambelí (*Hind* and *Bomb.*), Jati (*Beng.*)

History, Uses, &c.—The plant is cultivated everywhere in India. The Sanskrit name is Jati; from the flowers a perfumed oil is prepared which is a favourite perfume amongst the Hindus. Their physicians prescribe the leaves as a remedy in skin diseases, ulcers of the mouth, otorrhœa, &c. Chakradatta mentions the use of the fresh juice of the leaves as an application to soft corns and of an oil prepared with it in otorrhœa. In the Bhavaprakása the leaves are recommended to be chewed by those who suffer from ulceration of the mucous membrane of the mouth. (Confer. Dutt's Mat. Med. of the Hindus, p. 190.)

Mahometan writers consider the plant to have deobstruent, anthelmintic, diuretic and emmenagogue properties. Mír Muhammad Husain mentions the use of the flowers applied in the form of plaster to the loins and pubes as an aphrodisiac. He classes G. grandiflorum along with several other kinds of Jasmine under the name of Yasmín.

Description.—J. grandiflorum is a shrubby scandent plant. The leaves are opposite, pinnate, exterior three or five leaflets, confluent; peduncles terminal, few flowered; flowers large, white, tipped with pink, very fragrant. It is known to gardeners as the Catalonian or Spanish Jasmine.

Jasminum sambac, *Willd., Bot. Reg., t.* 1; *Bot. Mag., t.* 1785; *Wight Ic., t.* 704, *Vernacular*—Varshiki (*Sans.*), Mogra (*Hind.* and *Beng.*), Mogri (*Bomb.*), Mallippu (*Tam.*), is considered to have the same properties as G. grandiflorum. In the Pharmacopœia of India the flowers, upon the authority of Mr. J. Wood, are said to have considerable power as a lactifuge; he speaks of them as effectual in arresting the secretion of milk in the puerperal state, in cases of threatened abscess. For this purpose about two or three handfuls of the flowers are bruised and applied to the breasts and renewed once or twice a day. The secretion is sometimes arrested in twenty-four hours, though generally a longer time is required. Mr. Wood speaks of this fact as being well known in Madras.

In Goa the root of the wild variety is used as an emmenagogue.

Description.—Stem and branches woody, twining; leaves opposite, short petioled, cordate-ovate, or oblong waved, sometimes scalloped, pointed, smooth, except when young; in the axils of the veins on the back of the leaves there are tufts of down; flowers terminal, generally forming small trichotomous umbellets, white, fragrant; calyx bordered with from 5 to 9 long, subulate, permanent segments; stigma clubbed; berries twin, each round, smooth, juicy, one-seeded, shining, black. The double varieties do not fruit.

Jasminum arborescens. *Roxb., var latifolium*; *Wight Ic., t.* 703. *Vern.*—Kúsar (*Bomb.*), Madhvi (*Sans.*) A tall climbing shrub, with broad, heart-shaped leaves, and white flowers in terminal corymbs, common in the Concan jungles.

The juice of the leaves is used with pepper, garlic and other stimulants as an emetic in obstruction of the bronchial tubes by viscid phlegm. Seven leaves will furnish sufficient juice for a dose. For young children the juice of half a leaf and of four leaves of Agásta (Sesbania grandiflora) may be mixed with two grains of black pepper and two grains of dried borax and given in honey.

SAPOTACEÆ.

Bassia latifolia, *Roxb.*, *Cor. Pl.* 20, *t.* 19; *Bedd. Fl. Sylv.*, *t.* 41. The flowers and seeds.

Vernacular.—Moha (*Hind.*), Mohra (*Bomb.*), Maua (*Beng.*), Kattu-iluppai (*Tam.*)

History, Uses, &c.—Dutt informs us that the distilled spirit obtained from the flowers is described by Susruta as heating, astringent, tonic and appetizing. The flowers are regarded as cooling, tonic and nutritive. They enter into the composition of several mixtures of a cooling and demulcent character.

The Sanskrit name is Madhuka. The concrete oil of the seeds, Madhuka-sára, is recommended by Chakradatta as an application to the head in cephalalgia. I know of no Arabic name for the tree. Ibn Batuta, who visited India in 1332, calls it مهوى (Mahwa), and remarks that the flowers when dried in the sun taste like figs. The Persians call it Darakht-i-gul-chakán in allusion to its deciduous flowers. The following account of the tree is given by Dr. Gibson in Hooker's Journal of Botany, 1853, p. 90:—"This flower is collected in the hot season by Bheels and others, from the forests, also from the planted trees, which are most abundant in the more open parts of Guzerat and Rajwarra. The ripe flower has a sickly sweet taste resembling manna. Being very deciduous, it is found in large quantities under the trees every morning during the season. A single tree will afford from 200 to 400 lbs. of the flowers. The seeds afford a great quantity of concrete oil used in the manufacture of soap. The Forest or Bheel population also store large quantities of the dried flowers as a staple article of food, and hence in expeditions undertaken for the punishment or subjection of those tribes when unruly, their Bassia trees are threatened to be cut down by the invading force, and the threat most commonly insures the submission of the tribes. In Guzerat and Rajputana every village has its spirit shop for the sale of the distilled liquor from the flowers. In the island of Caranja, opposite to Bombay, the Government duty on the spirits distilled (chiefly from this flower) amounts to at least £60,000 per annum; I rather think that £80,000 is most generally the sum. The Parsees are the great distillers and sellers of it in all the country between Surat and Bombay, and they usually push their distilleries and shops into the heart of the forest which lines the eastern border and hills of those countries. The spirit produced from Bassia is, when carefully distilled, much like good Irish whisky, having a strong, smoky, and rather fetid flavour; this latter disappears with age. The fresh spirit is, owing to the quantity of aromatic or empyreumatic oil which it contains, very deleterious; and to the European troops stationed in Guzerat some thirty years ago appeared to be quite as poisonous as the worst new rum of the West Indies has generally proved to our soldiers. It excited immediately gastric irritation, and on this supervened the malarious fever so common in those countries." Drury tells us that in 1848 a quantity of Mahwa oil was forwarded to the secretary of the E. I. and China Association, with the view of ascertaining its market value and applicability for the manufacture of candles and soap. The managing director of Price's Patent Candle Company stated in reply:—"I beg to inform you that the Mowah oil of which you furnished us samples, is worth in this country for the manufacture of candles £8 per ton less than Petersburg tallow. We have tried a great many experiments upon it, and found it to be of the same value as cocoanut oil, as its being harder makes up for the colour being inferior. Large quantities could be used in this country at about £35 per ton. I send some candles and oil, but fear that the former will not remain in a solid state through the voyage to India. We have however processes secured to us by which we can make candles from Mowah oil sufficiently hard for the Indian market." Mowrah oil may be used in the preparation of Ung. Hyd. Nitratis in the same manner as Kokam oil. (See Garcinia indica.) It is stated in the Pharmacopiœa of India that the residuum or cake left after the expression of the oil (Ilupai punak, *Tam.*), is employed as an emetic. Some cases of poisoning by stramonium, in which it was so employed, are reported by Dr. Short. (Madras Quart. Med. Journ. VI., 286.) B. longifolia is confined entirely to the southern limits of the Bombay Presidency. The Mowrah flowers of the Bombay market are those of B. latifolia. The spirit has an offensive smell which is not easily removed by rectification. Toddy spirit is to be preferred for medicinal purposes. Ainslie tells us that the gummy juice which exudes from the bark of B. longifolia is used in Southern India as a remedy for rheumatic affections, and the bark itself in decoction as an astringent and also for the cure of itch. For the last few years Mowrah flowers have been largely exported to France for the purpose of distillation; one cwt. of flowers yield about 6 gallons of proof spirit; in 1881-82, 57,000 cwts. were sent; in 1882-83, 68,829 cwts., valued at Rs. 1,61,317; and in 1883-84, 227,114 cwts., valued at Rs. 5,70,879.

Description.—Bassia latifolia produces cream-coloured, fleshy flowers in March and April, and in August a reddish-yellow fruit from 1 to 2 inches long, which contains from 1 to 4 seeds; these are light brown, about 1½ inch long and ¾ of an inch broad, irregularly ovoid in shape, with a large scar on one side and a ridge on the other, terminating in two slight prominences; the shell is thin and brittle, and the seed consists of two large oily cotyledons, easily separated, white when fresh, but soon turning brown when kept, they yield a greenish-yellow oil, which becomes a solid white mass after a short time, and is known as *Doli oil.* The dried flowers at a little distance have the appearance of raisins; on closer inspection they are seen to be fleshy, sticky, compressed, hollow bodies, about $\frac{6}{10}$ths of an inch long, and nearly as broad, with an aperture at both ends, the upper being much the larger and serrated. Upon being soaked in water they assume an almost globular form, and the numerous anthers are seen attached by very short filaments to inside of the corolla. The taste of the dried flowers is acid and sweet, and almost similar to that of the common pudding raisin.

Microscopic structure.—The fleshy substance of the calyx, which is about 1-10th of an inch in thickness and translucent, consists of a parenchyma which may be divided into two portions; an outer or cortical, consisting of smaller cells, and an inner consisting of large cells; it is traversed by numerous bundles of spiral vessels; some of the cells contain crystalline masses of sugar; all of them granular matter; there is no starch.

Chemical composition.—The flowers do not appear to have been examined. The oil of the seeds is greenish yellow but becomes colourless after exposure to the light; it has a faint and rather agreeable odour, sp. gr. 0·958, consistence buttery. It melts at 27° to 30° C.; dissolves sparingly in absolute alcohol, readily in ether. By saponification it yields oleic acid, glycerine and two fatty acids. One has the composition $C^{15} H^{30} O^{2}$; the other is identical with stearic acid. (Hardwicke.) The oil is used in Western India in the preparation of the common country soap. The flowers of B. longifolia have been examined by. MM. Alf. Riche and A. Rémont (1880), who found them to contain 60 % of fermentable sugars, and 8·50 % of crystallizable sugar. The same observers found the oil of the seeds to have a melting point of 53°.—(Jour. de Phar. et de Chim., Mars., 1880.)

Commerce.—Value of the dried flowers, Rs. 20 to Rs. 25 per candy of 7 cwts.; of the oil, Rs. 4 per Surat maund of 37½ lbs.

Mimusops Elengi, *Linn.*, *Gärtn. Fruct. i.*, *t.* 42; *Lam. Ill.*, *t.* 300; *Wight Ic.*, *t.* 1586; *Bedd. Fl. Sylv.*, t. 40. The bark and flowers.

Vernacular.—Maulsari (*Hind.*), Bakul, Ovaḷi (*Bomb.*), Bakul (*Beng.*), Mogadam (*Tam.*)

History, Uses, &c.—This highly ornamental tree, with dark green, oblong, alternate leaves and small white fragrant flowers is very common in gardens on the Western Coast. It is the Vakula of Sanskrit writers; in Hindustani it is sometimes called Bolsárí, a name also current in Guzerat. At Nagpore, where it is common, the native name is Taindú. Graham tells us that it grows wild in the ravines at Khandalla, where it is sometimes called Woula.* Chakradatta mentions the astringent properties of the unripe fruit, and recommends it to be chewed for the purpose of fixing loose teeth. He also mentions a decoction of the astringent bark as a useful gargle in diseases of the gums and teeth. In the Concan a similar use is made of the unripe fruit, and the fruit and flowers along with other astringents are used to prepare a lotion for sores and wounds. Mír Muhammad Husain notices the practice of planting this tree on account of its handsome appearance. He says that the unripe fruit and seeds have powerful astringent properties, and that the decoction of the bark is useful as an astringent in discharges from the mucous membrane of the bladder and urethra, and also as a gargle in relaxation of the gums, &c. He mentions the use of a snuff made from the dried and powdered flowers in a disease called Ahwah, common in Bengal. The symptoms of this disease are strong fever, headache and pain in the neck, shoulders and other parts of the body. The powdered flowers induce a copious defluxion from the nose and relieve the pain in the head. The flowers are much used by the natives on account of their perfume, which they retain when dry; pillows are sometimes stuffed with them, and they afford a distilled water. The juice of the bark and unripe fruit is used by silk dyers to fix colours.

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* Probably a mispronunciation of ओवळी.

Description.—The bark is red, woody and fibrous, and has a thin grey epidermis studded with lichens; its general appearance when dry reminds one of red cinchona, but the inner surface is marked with whitish stains as if it were mildewed. On breaking the bark these stains are seen to penetrate the substance to some depth; they are caused by the drying up of the milky juice with which the tree abounds. Upon soaking a piece of dry bark in water it becomes coated with mucilage, and a milky fluid can be squeezed out from its freshly cut surface. Microscopic examination discovers no distinctive characteristic. The taste is bitter and astringent. The flowers are white and fragrant; calyx inferior, eight-leaved in a double series; leaflets lanceolate, the four exterior ones leathery, larger and permanent; corol one petalled, tube very short, fleshy, border composed of a double series of segments; the exterior one consists of sixteen, spreading; the interior one of eight, generally contorted, and converging, all are lanceolate, a little torn at their extremities; nectary eight-leaved, conical, ragged, hairy near the base, inserted alternately with the filaments into the mouth of the tube, converging filaments eight, short, hairy; anthers linear, sharp-pointed below, two parted, converging. The berry is oval, smooth, when ripe yellow, and edible, one or more celled, according to the number of seeds that ripen; seed solitary, oblong, compressed, attached to the bottom of the cell, covered with a smooth, hard, thick, integument, lined with a veined membrane; perisperm conform to the seed, two-lobed, pointed at the base, the lobes uniting round the radicle; above the radicle they are often entirely divided by the large cotyledons, which extend to, or rather through its margins; embryo erect; cotyledons large, oval; plumule minute; radicle inferior, linear oblong.

No chemical examination appears to have been made, nor is any part of the plant an article of commerce.

Mimusops hexandra, *Roxb., Cor. Pl. I.* 16, *t.* 15; *Wight Ic., t.* 1587, *Vernacular*—Rájádani (*Sans.*), Kshiri (*Hind.*), Khirkhejur, (*Beng.*), Rájan and Kerni (*Bomb.*), Palla (*Tam.*), has much the same properties as M. elengi. Graham remarks:—" This is a pretty tree, with rigid branches and broad wedge-shaped leaves. It is very common on Malabar Hill, Bombay, but seldom flowers. The Mussalmans planted it along with Elengi. The grove at Imaumpore, near Ahmednugger, consists entirely of it. The wood is much used in Guzerat for a variety of purposes, such as making sugarmill beams, well frames, and other things where toughness is required. The fruit is eaten."

The bark, which is used medicinally, is exactly similar to that of M. elengi. In the Concan the milky juice made into a paste with the leaves of Cassia fistula and seeds of Calophyllum inophyllum, is applied to boils. The juice of a Loranthus, which grows upon the tree, is extracted by heat and given with long pepper in cramp.

Achras Sapota, *Linn., Bot. Mag., t.* 3111 *and* 3112; *Gärt. Fruct.* 2, *t.* 104.

The Sapota Plum, or Bully Tree of the West Indies, is now completely established on the Western Coast, the natives eat the fruit, which they call *Chikku* and *Kávath,* and are acquainted with the astringent properties of the bark. In the West Indies the seeds are known to be aperient and diuretic, and the bark (*Sapotilla bark*) is reputed to be tonic and febrifuge. M. Bernou has isolated from the bark a crystalline alkaloid which he proposes to name '*Sapotine.*' It is soluble in ether, chloroform, and alcohol, but insoluble in water. Besides this alkaloid, he has found the bark to contain two resins, and a large proportion of '*Sapotannic acid,*' to the latter of which it owes its astringency. (L'Union Pharm. xxiii. 291; Year-Book of Pharm. 1883, p. 215.) In the Concan the fruit soaked in melted butter all night and eaten in the morning is considered to be an excellent preventive against biliousness and febrile attacks.

EBENACEÆ.

Diospyros Embryopteris, *Pers.*, *Bot. Reg.*, *t.* 499; *Bedd. Fl. Sylv.*, *t.* 69; *Roxb. Cor. Pl. I.*, *t.* 70. The fruit.

Vernacular—Gáb (*Hind.* and *Beng.*), Timbírí (*Bomb.*), Tumbilik-kai, Panichekai (*Tam.*)

History, Uses, &c.—This tree, the Sanskrit name of which is Tinduka, is common in most parts of India, and the astringent juice of the unripe fruit is sometimes used by the Hindus as an application to fresh wounds. Speaking of Ebony, Mír Muhammad Husain in his Makhzan notices the Gáb as belonging to the same genus, but says nothing about its medicinal properties.

Gœrtner in his work, "De Fructibus et seminibus Plantarum" (I., 145), described it as far back as 1788 under the name of Embryopteris peregrina. Ainslie tells us that it is the Lym appel of the Dutch, and the Mangostan utan of the Malays. Rheede, speaking of the tree, says:—"Arboris cortex in pulverem redactus ac cum oryzœ infuso, et expresso e matura nuce Indica lacteo succo mixtus, atque febricatantibus exhibitus æstum potenter extinquit; ex seminibus oleum experimitur." (*Vide* Hort. Mal. III., p. 46, t. 41.) The circumstance that the unripe fruit abounds in an astringent viscid juice, which is used by the natives of India for daubing the bottoms of boats, was communicated by Sir William Jones to Roxburgh in 1791. The introduction of the fruit into European practise in India is due to O'Shaughnessy. In 1868 it was made official in the Pharmacopœia of India. In Bombay the fruit is eaten by the poorer classes. The seeds are preserved by the country people and given as an astringent in diarrhœa. The testa is the astringent part, the albumen being almost tasteless. The leaves are sold in the bazars for folding cigarettes. Although the ripe fruit is very sweet, insects will not touch it.

Description.—This fruit ripens in April upon the young wood of the previous year, and the blossoms appear at the same time upon the young wood just forming. The fruits vary much in size and in the number of seeds they contain. The largest are about 1½ inch in diameter, of the shape of a small apple, and of a yellow colour, marked with rusty fissured patches. The rind consists of two layers, an outer or epidermis composed of tesselated cells, with large granular nuclei of a darker colour than the rest of the cell. The rusty spots are formed by a deposit of colouring matter in the nuclei and cells. The inner layer of the rind is composed of wood cells; many large irregular-shaped crystals are also seen. Within the fruit and surrounding the solitary seeds, which are crowded together in the centre, is a yellow pulp consisting chiefly of very large irregularly oblong cells, 1-75th to 1-100th of an inch in length, and some granular and fibrous tissue forming a sort of meshwork. The pulp tested with iodine gives no indication of the presence of starch. Each seed is enclosed in a strong semitransparent elastic coat, which is a web of spindle-shaped cells with fine granular nuclei; the seeds are bean-shaped, with a shining irregular surface of a dark brown colour; the endopleura penetrates into the albumen in narrow brown strips, as in the nutmeg, but does not reach the centre of the seed; the albumen is horny and translucent, of a steel grey colour; the margin of the seed in marked by a light-coloured groove, except at the micropyle, which projects; the cotyledons are oblong and heart-shaped at the base.

Diospyros fruit is intensely astringent until quite ripe, when it suddenly becomes mawkish and sweet, without a trace of its former astringency. This is noticed in the 'Pharmacographia,' but not in the Indian Pharmacopœia, where unripe fruit should have been ordered.

In preparing the extract steel or iron implements should not be used, as they turn the juice black; the extract when finished has much the colour and consistence of shell lac.

Chemical composition.—No satisfactory analysis has been made of this fruit, but there can be no doubt that in common with that of other species of Diospyros, it is, when immature, rich in tannic acid, pectin and glucose.

Ebony, the Abnus (εβένος Gr., ebenus, Lat.) of Mahometan writers on Materia Medica, is used medicinally in India. It is described as astringent, attenuant, and lithontriptic, and was used medicinally by the Greeks and Romans.* The author of the Makhzan-el-Adwiya mentions several kinds, amongst others that obtained from an Indian species called "Taindú," which is the Diospyros melanoxylon of Roxburgh.

STYRACEÆ.

Styrax Benzoin, *Dryander., Bentl. and Trim., t.* 169. Benzoin.

Vernacular.—Lubán, Úd (*Hind., Beng.,* and *Bomb.*), Shambiráni (*Tam.*)

History, Uses, &c.—Benzoin or Gum Benjamin does not appear to have been known to the ancient Hindus, nor is there any evidence that the Greeks and Romans or even the earlier Arabian physicians were acquainted with it. There is however no doubt that in the original and legitimate storax they were acquainted with a fragrant resin in separate or more or less agglutinated tears, somewhat resembling Benzoin, and produced by the Styrax officinalis of Linnæus. Specimens of this amygdaloid storax are still to be found in old Materia Medica collections. (Confer. Hanbury's Science Papers, p. 129.) Benzoin is first mentioned by the Arabian traveller Ibn Batuta, who visited Sumatra between 1325 and 1349. He calls it Lubán Jáví or Java Lubán, Java being a general name among the Arabs and Persians for the Eastern Archipelago. In more recent Arabic and Persian works, Benzoin is called Hasi-lubán-el-Javi, which may be translated 'pebbly or amygdaloid frankincense from Java,' and seems to imply the existence of another kind of pebbly frankincense. The author of the Makhzan-el-Adiwya tells us that Hasi-lubán-el-Jávi is the same as Darv or Zarv (ضرو). On turning to this article we find the following synonyms given: Fúzúkas* (*Greek*), Zarwa (*Syrian*), Fashashísh (*Turkish*), Dur-i-haskhak Arísa, Kalangúra, and Kamkám (*Persian*). This tree is said to grow in the Hejaz, Yaman, India and other countries, and to resemble the oak, the leaves being soft and reddish at the edges, and the fruit a cone like the fir, but with larger seeds; its bracts and thorns turn red when ripe. The exudation is at first like a grain of wheat, but gradually increases until it reaches the size of a melon; from it a dark pitch-like substance may be separated. A decoction of the leaves is mentioned, and an oil which is obtained from the seeds. This description might do for Liquidamber orientale, but cannot apply to Storax Benzoin. As regards the drug benzoin, Mír Muhammad Husain must have been well acquainted with it, as it was in common use in India before his time. He probably regarded it as a kind of amygdaloid storax. Ainslie mentions it use in Southern India by Tamool physicians as a remedy in phthisis and asthma. The Mahometans use it for the same purpose, and direct the fumes to be inhaled. As an incense it is much used by all classes, the imports into Bombay averaging 6,000 cwts. per annum. For the early history of this drug in Europe, the Pharmacographia may be consulted. In that work will also be found a summary of what is known regarding the method of collecting it in Sumatra and Siam.

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* Conf. Dios. i., 114; Pliny 16, 40.

Description.—The following excellent description, together with a summary of its chemical composition, is extracted from the Pharmacographia:—

"SIAM BENZOIN.—The most esteemed sort is that which consists entirely of flattened tears or drops, an inch or two long, of an opaque, milk-like white resin, loosely agglutinated into a mass. More frequently the mass is quite compact, consisting of a certain proportion of white tears of the size of an almond downwards, imbedded in a deep, rich amber-brown, translucent resin. Occasionally the translucent resin preponderates, and the white tears are almost wanting. In some packages the tears of white resin are very small, and the whole mass has the aspect of a reddish-brown granite. There is always a certain admixture of bits of wood bark and other accidental impurities.

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* Probably a corruption of ζυγὸς, a name applied to the Storax tree in modern Greek.

"The white tears when broken, display a stratified structure with layers of greater or less translucency. By keeping, the white milky resin becomes brown and transparent on the surface, but from some experiments made by one of us (F.) it does not appear that the opacity is due to water, but rather to a peculiar molecular (semi-crystalline ?) state of the resin. Siam benzoin is very brittle, the opaque tears showing a slightly waxy, the transparent a glassy, fracture. It easily softens in the mouth, and may be kneeded with the teeth like mastich. It has a delicate balsamic, vanilla-like fragrance, but very little taste. When heated it evolves a more powerful fragrance together with the irritating fumes of benzoic acid; its fusing point is 75° C. The presence of benzoic acid may be shown by the microscopical examination of splinters of the resin under oil of turpentine.

"Siam benzoin is imported in cubic blocks, which take their form from the wooden cases in which they are packed while the resin is still soft."

"SUMATRA BENZOIN.—Prior to the renewal of direct commercial intercourse with Siam in 1853, this was the sort of benzoin most commonly found in commerce.

"It is imported in cubic blocks exactly like the preceding, from which it differs in its generally greyer tint. The mass, however, when the drug is of good quality, contains numerous opaque tears, set in a translucent, greyish-brown resin, mixed with bits of wood and bark. When less good, the white tears are wanting, and the proportion of impurities is greater. We have even seen samples consisting almost wholly of bark. In odour, Sumatra benzoin is both weaker and less agreeable than the Siam drug, and generally falls short of it in purity and handsome appearance, and hence commands a much lower price. The greyish brown portion melts at 95°, the tears at 85° C."

Chemical composition.—Benzoin consists mainly of amorphous resins perfectly soluble in alcohol and in potash, having slightly acid properties, and differing in their behaviour to solvents. If two parts of the drug are boiled with one part of caustic lime and twenty parts of water, benzoic acid is removed. From the residue the excess of lime is dissolved by hydrochloric acid, and the remaining resins washed and dried. About one-third of them will be found readily soluble in ether, the prevailing portion dissolves in alcohol, and a small amount remains undissolved. Subjected to dry distillation, benzoin affords as chief product Benzoic acid, $C^7 H^6 O^2$, together with empyreumatic products. Benzoic acid exists ready formed in the drug to the extent of from 14 to 18 per cent., its extraction is easily accomplished by the aid of an alkali, most advantageously by milk of lime, which does not combine with the amorphous resins. Most pharmacopœias require not the inodorous acid obtained by a wet process, but that afforded by sublimation, which contains a small amount of fragrant empyreumatic products. The resin when repeatedly subjected to sublimation affords as much as 14 per cent. of benzoic acid.

Kolbe and Lautemann in 1860 discovered in Siam and Penang benzoin together with benzoic acid, an acid of different constitution, which in 1861 they recognised as Cinnamic Acid, $C^9 H^9 O^2$. Aschoff (1861) found in a sample of Sumatra benzoin, cinnamic acid only, of which he got 11 per cent.; and in amygdaloid Siam and Penang benzoin only benzoic acid. In some samples of the latter, one of us (F.) has likewise met with cinnamic acid. (*Op cit.*, 2nd Ed., p 407.)

Commerce.—The imports of Benzoin into Bombay in the year 1871-72 were 5,975 cwts., and the exports 1,043 cwts.; no later statistics are available, but there is probably little difference in the quantity imported. Average value in Bombay, first quality, Rs. 30 to Rs. 35 per maund of 37½ lbs. The worst quality is sold as low as Rs. 10 per maund.

Symplocos racemosa, *Roxb.* The bark.

Vernacular.—Lodhra (*Hind.*, *Beng.* and *Bomb.*)

History, Uses, &c.—This is a small tree, a native of Nipal and Kumaon, and of Burdwan and Midnapore in Bengal. In Bombay it is common on the Ghauts, and is described in Dalzell and Gibson's Bombay Flora as Hopea racemosa.* In Sanskrit it is called Lodhra and Tillaka. Sanskrit writers describe it as cooling, astringent and useful in bowel complaints, eye diseases, ulcers, &c. It enters into the composition of numerous prescriptions for bowel complaints. A decoction is used as a gargle for giving firmness to spongy and bleeding gums; Chakradatta mentions a paste containing Lodhra, Rasot, and Cyperus rotundus as used for the same purpose. The Amritaságara recommends the following application for ophthalmia, *viz.*, Lodhra, liquorice root, burnt alum, and rusot, equal parts, rubbed into a paste with water, and applied round the eyes. (Dutt's Hind. Mat. Med., p. 189.)

Roxburgh remarks that the bark is in request among the dyers of red in Calcutta, and seems to be used as a mordant only. He gives the following receipt:—"For three yards of cloth take Lodh bark, Chebulic myrobalans of each 2 ozs., rub them down with water, then add more water, steep the cloth and dry it. Next take 2 ozs. of alum, dissolve it in water, and boil the cloth in the solution for an hour, then wash and dry it. Lastly, take the bark of Morinda tinctoria and flowers of Grislea tomentosa of each 2 ozs., Madder root 1 lb., mix them with lukewarm water and let it boil, then put in the cloth and keep it in the boiling liquid for forty minutes." In this receipt the Lodh appears to me to be used as a dye to modify the colour afterwards produced by the Morinda and Madder. The middle layers of Lodh bark contain much red colouring matter. Lodhra is often used in Bombay in the preparation of plasters (*lép*); it is supposed to promote the maturation and resolution of stagnant humours. In Europe it was formerly looked upon as a cinchona bark, and has been known at various times as "*Ecorce de lautour,*" "*China nova,*" "*China Calafornica,*" "*China Brasilensis,*" and *China Paraguatan.*" Its present cognomen is "Lotur bark." Drs. Charles and Kanny Loll Dey recommend the bark in 20 gr. doses mixed with sugar as a remedial agent in menorrhagia due to relaxation of the uterine tissue ; it should be given two to three times a day for three or four days. Dr. K. L. Dey considers that the drug has a specific action upon relaxed mucous membranes. (Phar. Journ., Sept. 24, 1881.)

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* The Concan tree appears to be a variety of S. racemosa, *Roxb.*, but is described in the Flora of British India as S. Beddomei, Vol. III., p. 582.

Description.—The bark is very soft and friable, of a light fawn colour ; the external surface corky and much fissured transversely ; the internal of a lighter colour and fibrous texture. On making a transverse section a middle layer of a red colour is seen between the corky and fibrous portions.

Microscopic examination shows that the coloured layer is chiefly composed of oblong cells containing red colouring matter ; the inner layer of the bark consists almost entirely of woody fibre. The taste is faintly balsamic and astringent.

Chemical composition.—Dr. Hesse reports (Ber. d. deutsch ch. Geselsch ; X., 1) that he has obtained from this bark three alkaloids, which he has named "*Loturine,*" "*Colloturine,*" and "*Loturidine,*" and between which he thinks probably there is the same relation as exists between cusconine, aricine, and cusconidine. Loturine is present in largest quantity (0·24)%; it is crystalline, and forms crystalline salts. Colloturine is also crystalline, but loturidine is amorphous. All three alkaloids in dilute acid solutions show an intense blue-violet fluorescence. Winckler obtained from this bark an alkaloidal substance which he named "Californine," but Hesse believes this to have been a mixture of the acetates of the three alkaloids. Pelletier, Caventon and Winckler have separated *Kinovin* from the bark of *China nova.* Kinovin forms an amorphous, nearly transparent resin, triturable to a light, white powder, inodorous, or faintly balsamic when warmed. Tasteless at first, but afterwards very persistently and disagreeably bitter and acrid. Neutral. Electric when rubbed. (Winckler, Hlasiwetz.) In alcoholic solution it exerts a dextro-rotatory action on polarised light; (*a*) j = 52·4 (De Vrij). Kinovin may be obtained in the anhydrous state by keeping it in a vacuum for a month, but cannot be dehydrated at once, even at a temperature of 190°: kinovin dried at 100° to 140° contains from 1 to 2 atoms of water, which is given off at 160° to 180°. (Hlasiwetz.) According to Hlasiwetz, kinovin corresponds with the formula $C^{60} H^{48} O^{16}$; according to Petersen the formula is $C^{15} H^{12} O^{4}$; according to Schnederman $C^{38} H^{30} O^{10}$. (Confer. Gmelin's Handbook XVIII., p. 26.)

Commerce.—Value, Rs. 3 to Rs. 3½ per Surat maund of 37½ lbs.

APOCYNACEÆ.

Alstonia scholaris, *R. Br.*, *Wight Ic.*, *t.* 422; *Bedd. For. Fl.*, *t.* 242; *Rheede Hort. Mal. i.*, *t.* 45; *Bentl. and Trim*, *t.* 173. The bark.

Vernacular.—Chhátián (*Hind.*), Chhátin (*Beng.*), Satwín (*Bomb.*), Ezhilaip-pálai (*Tam.*)

History, Uses, &c.—It is called in Sanskrit Saptaparna, Vísálatvak, and Vrihattvak; the two latter names are given to it on account of the thickness and sponginess of the bark. Hindu physicians describe it as tonic, alterative and useful in fever and skin diseases. Susruta gives the following formula for use in catarrhal fever. Take of the bark of Alstonia, stems of Tinospora cordifolia, bark of Azaddirachta indica, and the bark of Betula Bhojpatra, equal parts, in all two tolás (320 grs.), and prepare a decoction in the usual way. It also enters into the composition of several formulæ for skin diseases. (Confer. Dutt's Hindu Mat. Med., p. 192.) The tree has obtained the trivial name scholaris from the fact of its planks covered with a layer of sand being used as school-boards on which children trace their letters, as in the Lancastrian system. The natives have a superstitious fear of it, and say, it assembles all the trees of the forest once a year to pay homage. (Graham.)

Rheede in 1678 and Rumphius in 1741 described and figured the tree and noticed the medicinal use of the bark by the natives. Mr. Nimmo in 1839 called attention to it as a powerful tonic, and suggested its use as an antiperiodic. (Graham's Bomb. Plants, p. 115.) Dr. Gibson, in 1853, contributed a short but interesting account of the drug to the Pharmaceutical Journal. (Vol. XII., p. 422.) In the Pharmacopœia of India it is official, and is described as an astringent tonic, anthelmintic, and antiperiodic. The bark is given in leprosy in the Concan, an extract being prepared from the fresh bark and given in milk; it is also prescribed in dyspepsia with constipation and as an anthelmintic. Lastly, Gruppe, a pharmacien of Manilla, has obtained from the bark an uncrystallizable principle which he has named ditain. In the report on the Centennial Exhibition presented to the American Pharmaceutical Association (Transactions, 1877), the following account of this drug is given:—"Echites scholaris (Alstonia scholaris, Brown,) grows wild abundantly in the central provinces of the island of Luzon, where it has long been known and esteemed by the natives under the name of 'Dita,' as a most efficient tonic and febrifuge. The people using it from time immemorial in decoction against malignant, intermittent, and remittent fevers with the happiest result, the attention of our leading physicians was excited, and the active principle ditain has now become a staple article, and *ranks equal* in therapeutical efficiency with the best imported sulphate of quinine. Numberless instances of private and hospital practice, carried out by our best physicians, have demonstrated this fact. Equal doses of ditain and of *standard quinine sulphate have had the same medicinal effects*; besides leaving none of the disagreeable secondary symptoms, such as deafness, sleeplessness, and feverish excitement, which are the usual concomitants of large quinine doses, ditain attains its effects swiftly, surely, and infallibly.

"(*a*) We use ditain generally internally in quantities of half a drachm daily for infants, and double the dose for adults, due allowance being made, of course, for age, sex, temperament, &c. Given internally our standard (Manilla) formula is—

FOR INFANTS.

℞ Ditain.................... ʒss
Aq. Flor. Aur. .... ℥v
Syr. Citri. .... ℥i
Sig.—One spoonful every hour.

FOR ADULTS.

The same mixture with 1 drachm of ditain.

"(*b*) Our medical practitioners use ditain in the form of injections in the rectum. For this purpose experience has suggested—

FOR INFANTS.

℞ Ditain .... ʒi
Water .... 1 lb. Troy.
Dissolve.—For three injections, one every three hours.

FOR ADULTS.

The same preparation, only instead of one use two drachms of ditain; same intervals.

"(*c*) We derive very beneficial effects from its use, too, under the form of poultices. Powdered dita bark, cornflour, each half a pound; hot water sufficient to make a paste. Spread on linen and apply under the armpits, and on the wrists and ankles, taking care to renew when nearly dry, and provided the desired effects should not have been obtained. The results arrived at by ditain in our Manilla hospitals and private practise are simply marvellous. In our military hospital and penitentiary practise, ditain has perfectly superseded quinine, and it is now being employed with most satisfactory results in the Island of Mindanao, where malignant fevers are prevalent. The extraction and preparation of ditain from the bark is analogous to that of quinine. Maceration with acidulated water aud precipitation are its leading features. I have obtained from 100 parts of bark, 5 parts ditain, 0·85 parts sulphate of lime, and 10 parts extractive matter, the latter, however, of no medicinal virtue whatsoever. As dita bark abounds in this country, and its manufacture is an inexpensive one, I hope to make its product acceptable and advantageous even in Europe. So far, its cost of manufacture will enable me to lay it down in any part of the world at one-third the price of quinine sulphate, warranted invariably of the same strength and purity."

Description.—The drug consists of irregular fragements of bark, ⅛ to ½ an inch thick, easily breaking with a short coarse fracture. The external layer is very uneven and much fissured, dark grey or brownish, sometimes with black spots; it readily separates when handled. The interior substance and inner surface (liber) is of a bright buff. A transverse section shows the liber to be finely marked by numerous small medullary rays. The bark has no particular odour; when chewed it communicates gradually to the palate a slightly bitter but not disagreeable taste.

Microscopic structure.—The cortical tissue is covered with a thin suberous coat, the middle layer of the bark is built up of a thin-walled parenchyme, through which enormous, hard, thick-walled cells are scattered in great numbers, and are visible to the naked eye, as they form large irregular groups of a bright yellow colour. Towards the inner part these stone-cells disappear, the tissue being traversed by undulated medullary rays, loaded with very small starch grains; many of the other parenchymatous cells of the liber contain crystals of calcium oxalate. The longitudinal section of the liber exhibits large but not very numerous laticiferous vessels, as elongated simple cells with perforated tranverse walls (sieve-cells) containing a brownish mass, the concrete milk-juice with which all parts of the tree abound.

Chemical composition.—In 1875, Jobst and Hesse exhausted the powdered bark with petroleum ether, and then extracted, by boiling alcohol, the salt of an alkaloid, which they called *Ditamine.* After the evaporation of the alcohol, it is precipitated by carbonate of sodium and dissolved by ether, from which it is removed by shaking it with acetic acid. Ditamine as again isolated from the acetate forms an amorphous and somewhat crystalline, bitterish powder of decidedly alkaline character; the bark yields about 0·02 per cent. of it.

From the substances extracted by means of petroleum ether, as above stated, Jobst and Hesse further isolated (1) Echicaoutchin, $C^{25} H^{40} O^{2}$, an amorphous yellow mass; (2) Echicerin, $C^{30} H^{48} O^{2}$, forming acicular crystals, melting at 157° C.; (3) Echitin, $C^{32} H^{52} O^{2}$, crystallized scales, melting at 170°; (4) Echitein, $C^{42} H^{70} O^{2}$, which forms rhombic prisms, melting at 195°; (5) Echiretin, $C^{35} H^{56} O^{2}$, an amorphous substance, melting at 52° C.

Echicaoutchin may be written thus: $(C^{5} H^{8})^{5} O^{2}$, echicerin $(C^{5} H^{8})^{6} O^{2}$, echiretin $(C^{5} H^{8})^{7} O^{2}$; these formulæ at once point out how nearly the three last named substances are allied. They are probably constituents of the milky juice of the tree. (Pharmacographia, 2nd Ed., p. 422.)

Hesse has since separated from Dita bark two other bases, *Echitamine* and *Echitenine.* He now reports that *Ditamine* exists in the bark in the proportion of 0·04 per cent. It is readily soluble in dilute acids, and differs from the alkaloids associated with it in being precipitated from its acid solutions by ammonia. Its formula deduced from the analysis of its platinochloride, is $C^{16} H^{19} NO^{2}$.

Echitamine is obtained from the liquor from which the ditamine has been extracted. On neutralizing this liquor, concentrating it by evaporation, and then adding hydrochloric acid and sodium chloride, impure echitamine hydrochloride is precipitated. The base isolated from this precipitate, and then purified, crystallizes in thick vitreous prisms, answering to the formula $C^{22} H^{28} N^{2} O^{4} + 4 H^{2}O$. When dried in vacuo these part with three molecules of water, leaving a strong base of the formula $C^{22} H^{28} N^{2}O^{4} + H^{2} O$, or $C^{22} H^{30} N^{2}O^{5}$, which the author calls echitamine hydrate, or echit-ammonium hydroxide. If in drying the heat be raised to and maintained at 150° C., another molecule of water is given off; but the anhydrous echitamine thus left is a much weaker base, and is reconverted into the original alkaloid by dissolving it in hydrochloric acid, and decomposing the hydrochloride. In consequence of the decided loss of basic properties accompanying the elimination of the last molecule of water, the author prefers to regard the monohydrated base as the normal form. The latter is a powerful alkaloid; it neutralizes acids perfectly, and yields well-defined crystallizable salts.

Echitenine.—This base is prepared from the mother liquors of echitamine hydrochloride, by precipitating with mercuric chloride, decomposing the precipitate with sulphuretted hydrogen, and then shaking with chloroform. It exists in the bark to the extent of only 0·01 per cent. Its composition corresponds to the formula $C^{20} H^{27} NO^4$. It is markedly bitter, of a brownish colour, and fuses above 120° C. With strong sulphuric acid it forms a reddish-violet, and with nitric acid a purple solution, the latter of which changes to green and ultimately to yellow. Its salts are amorphous. In the author's opinion all these alkaloids belong to one series:—

Ditamine	$C^{16} H^{19} NO^2$
?	$C^{18} H^{23} NO^3$
Echitenine	$C^{20} H^{27} NO^4$
Echitamine Hydrate (Echit-ammonium Hydroxide)	$C^{22} H^{30} N^2 O^5$

(Liebig's Annalen, cciii., 144) in Year-Book of Pharmacy for 1881.

Commerce.—The bark is not an article of commerce, but is well known and much used as a tonic by the Hindus in combination with ginger, &c. The tree is common on the Western Ghauts. It is very abundant in the Goa territory.

Rhazya stricta, *Decaisne. in Jacq. Voy. Bot., t.* 111. *Vernacular.*—Sewar (*Sind*).

This plant is widely distributed through Western Asia, from Yemen in Arabia, to the North-West Provinces of India. Its leaves, which are very bitter, are sold in the bazars in Sind, the natives using them in the preparation of cooling bitter infusions. R. stricta is a stiff-growing plant with erect stems 2 to 3 feet high, and upright thickish smooth leaves placed rather close together on the stem. Dr. Stocks describes the infusion as a good and peculiar bitter tonic, and recommends it for trial.

Holarrhena antidysenterica, *Wall.*, *Brand. For. Fl.*, *t.* 40 ; *Wight Ic.*, 1297. The bark.

Vernacular.—Kureya, Kaureya (*Hind.*), Kurchí. (*Beng.*), Pándhra Kúra, Dola Kúra (*Bomb.*), Veppalei (*Tam.*)

The seeds : Karwa-indarjau (*Hind.* and *Bomb.*), Tita-indarjau (*Beng.*), Kulappalai-virai (*Tam.*)

History, Uses, &c.—The bark and seeds of this tree, in Sanskrit Kutaja and Kálinga, are important articles in the Hindu Materia Medica. The bark is one of their principal remedies for dysentery. The seeds (Indrayava) are considered astringent, febrifuge and anthelmintic. Both bark and seeds are usually combined by Hindu physicians with a number of other medicines which are principally astringents and aromatics.

Examples of these prescriptions will be found in Dutt's Hindu Materia Medica (pp. 193 to 195). Arabic and Persian writers describe the seeds under the name of Lisán-el-asafír-el-murr, and Zabán-i-gungishk-i-talk (bitter sparrow's tongue) ; they consider them to be carminative and astringent, and prescribe them in chronic chest affections, such as asthma, also in colic and diuresis; besides this they attribute lithontriptic, tonic and aphrodisiac properties to them, and combined with honey and saffron make them into pessaries which are supposed to favour conception. I may mention incidentally that the use of medicated pessaries for this purpose is a common practise in India.* They are also used after delivery. Andarsárún is given as the Greek name for Inderjau ; it has probably been manufactured by some mediæval Greek writer. According to the Makhzan, the bark is the Tiwaj of Persian writers, which the author of the Tuhfat identifies with Talisfar, by some supposed to be the Indian bark used in dysentery by the Greek physicians under the name of μάκερ. The Arabians have confounded the Greek μάκερ with Mace. Ainslie mentions the bark as having been lately admitted into the British Materia Medica, under the name of Conessi bark, but his description of it and of the seeds is incorrect, and leads one to suppose that he must have been supplied with the bark and seeds of Wrightia tinctoria, instead of H. antidysenterica. With reference to the confusion which has long existed between the different species of Holarrhena and Wrightia, an interesting article by Dr. Wight will be found in the Phar. of India (App., p. 455), but as he deals only with the botanical differences between the plants, it may be useful to remark that the stem bark of H. antidysenterica may be distinguished by its thickness and dirty-white or buff colour; this is the Conessi bark of commerce. The root bark of the same tree is reddish brown, less thick, and studded with small warty prominences. The stem bark of Wrightia tinctoria is of a reddish brown colour but nearly smooth, the root bark of the same tree is dark brown or nearly black, and studded with numerous little warty projections. Wrightia bark is less bitter than Holarrhena.

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* Similar pessaries were used by the Greeks and Romans.

Conessi bark, also known as Codaga pala, Corte de pala, and Tellicherry bark, enjoyed for a time considerable repute in Europe. It has however fallen into disrepute, principally, according to Sir Walter Elliot, who regards it as one of the most valuable medicinal products of India, from the comparatively inert bark of W. tinctoria having been confounded with it. Favourable reports of its use as a remedy in dysentery will be found in the Pharmacopœia of India. For administration Mr. O. C. Dutt prefers a watery extract of the root bark, of which the average dose is about three grains in combination with half a grain or more of opium. When in the Goa territory, I observed that the natives used the root bark only of Holarrhena under the name Khaokurro. This is also the case in the Concan, where the root bark is given in infusion with Tinospora condifolia for fevers of long standing; its juice is also extracted and made into pills with aromatics as a remedy for diarrhœa and dysentery. The wood of Holarrhena is sold in the Bombay bazar under the name of *Dudhi*; it is very light and white, and turns well.

Description.—Bark of stem very thick, much twisted and quilled, of a dirty white or dull buff colour, external surface marked by numerous transverse ridges, internal surface longitudinally striated, taste very bitter, does not colour the saliva when chewed. The seeds resemble oats, are very bitter, and are contained in two long follicles about the thickness of a quill, each seed is furnished with a tuft of hairs on the upper end, that most remote from the foot stalk.

Chemical composition.—The bark and seeds contain a basic substance (Wrightine), to prepare which the pulverised seeds are treated with carbonic disulphide in a displacement apparatus to remove a fat oil, then dried and exhausted with hot alcohol; the extract freed from alcohol by distillation, is digested with a small quantity of dilute hydrochloric acid, and the evaporated filtrate is mixed with ammonia or sodic carbonate, which throws down a copious flocculent precipitate, consisting of the impure base.

Wrightine after washing with cold water forms an amorphous powder, insoluble in ether and in carbonic disulphide, soluble in water and alcohol, and especially in dilute acids, with which it forms uncrystallisable salts having like the base itself a persistent bitter taste. The acetic acid solution is precipitated by tannic acid; the hydrochloric acid solution gives flocculent precipitates with platinic, auric, and mercuric chlorides. (Stenhouse, Phar. Jour. (2), V. 493.) R. Haines (*Ibid.*, VI., 432) states that he obtained the same base from Conessi bark in 1858, and gave a short description of it in the *Transactions of the Medical and Physical Society of Bombay* (New Series IV., 38). He proposes to call it Conessine, and calculates, from the analysis of the free base, and of the platinum salt, the formulæ $C^{26} H^{42} N^2 O$ and $C^{25} H^{44} N^2 O$.

Commerce.—The bark and seeds are both articles of local commerce. Value, bark Re. 1½ per maund of 37½ lbs.; seeds, Rs. 25 per maund of 37½ lbs.

Wrightia tinctoria, *Br., Wight Ic., t.* 444; *Bedd. Fl. Sylv., t.* 241; *Bot. Reg., t.* 933, which has already been mentioned in connection with the last article, is the Kalakúra of Bombay, its seeds are the sweet indarjau of Indian druggists. The root is found in the shops in pieces 3 to 4 inches long, and from one inch to half an inch in diameter. The bark is of a dark brown colour externally and is studded with numerous little warty projections; the wood is white. Sections of the bark show that the parenchyma contains many cells filled with red colouring matter, as well as much starch; towards the inner part of the bark there are numerous large liber cells arranged in two continuous rings. The bark is moderately bitter, and colours the saliva red. The bark of the stem is also met with in the shops; it is smoother than the root bark, and of a paler colour. The want of bitterness will best distinguish these barks from the root bark of Holarrhena antidysenterica; they cannot possibly be confounded with the stem bark, which is entirely free from red colouring matter.

The seeds of Wrightia are furnished at the lower end, that next the foot stalk of the follicle, with a tuft of delicate white silky hairs; they are free from bitterness. Value, seeds, Rs.3-8 per maund of 37½ lbs.

Nerium odorum, *Solander, Bct. Mag.* 1799; *Bot. Reg., t.* 74; *Rheede Hort. Mal. ix., t.* 1, 2. The root.

Vernacular.—Kanír (*Hind.* and *Bomb.*), Karabi (*Beng.*), Alari (*Tam.*)

History, Uses, &c.—Dutt in his Hindu Materia Medica tells us that two varieties of N. odorum are described in the

Bhavaprakasa, namely, white and red-flowered. The properties of both are identical, their roots being regarded as poisonous when taken internally, and useful in skin diseases and inflammatory affections when applied externally. The Oleander has several Sanskrit names, such as Asvamáraka, signifying horse-killer, Karavira, &c. The following formula is given by Chakradatta :—Karavirádya taila: Take of sesamum oil 4 seers, decoction of the root of N. odorum (Karavira) 8 seers, cow's urine 8 seers, Plumbago rosea root and Báberang seeds, each ½ a seer, boil them together and prepare an oil in the usual way. To be used in eczema, impetigo, and other skin diseases.

The root of Oleander beaten into a paste with water is recommended by Sarangadhara to be applied to chancres and ulcers on the penis. According to Chakradatta the fresh juice of the young leaves is dropped into the eyes in ophthalmia with copious lachrymation. In Arabic and Persian works the plant will generally be found described under the name of Difli; other names are Sum-el-Himár and Kharzahrah, which both signify Asses-bane; it is identified with the Nerium of the Greeks.* The Mahometan physicians describe it as a most powerful resolvent and attenuant, only to be used externally; taken internally it acts as a poison upon men and animals. A decoction of the leaves is recommended to reduce swellings, and an oil prepared from the root bark in skin diseases of a scaly nature and in leprosy. Mír Muhammad Husain says that the Oleander is poisonous to insects, and that it cures itch. He also states that the leaves though poisonous to all fourfooted animals are a counter-poison against serpents. The latter statement appears to be copied from Pliny. (Confer. Nat. Hist. XXIV., II.) Ainslie informs us that the bark of the root and leaves are considered by the Vytians as powerful repellants, applied externally; and that the root is too often resorted to for the purpose of self-destruction by the Hindu women. The active principles of N. odorum are powerful heart poisons. 0·0016 grams of Neriodorein injected hypodermically into a large healthy frog caused in 14 minutes diminution of the heart beats from 70 to 12 per minute, followed by a temporary rise to 60; after the lapse of five minutes longer the heart ceased to beat. This cessation of the heart's action was closely followed by cessation of the respiration.

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* Nerium oleander, hardly different from the Indian plant. Conf. Dios. *περὶ νηρὶου* iv., 80; Pliny 16, 20 and 24, 11. It was also called by the Greeks and Romans Rhododaphne and Rhodadendron.

Description.—Roots crooked, bark thick, soft, external surface grey, corky, on young roots the corky layer is very thin, and the interior yellow colour of the bark is seen through it, inner surface yellow. The bark when cut or wounded exudes a pale yellow latex, which is resinous and very sticky. Odour somewhat acrid, like that of a raw potato. Taste acrid and bitter.

Microscopic structure.—In the bark of the roots the medullary rays are very numerous; their being loaded with yellow resinous juice makes them very conspicuous. The laticiferous vessels are numerous and generally in groups of two, three, or more. The wood is very porous, and abounds in large dotted vessels. Both bark and wood abound in starch.

Chemical composition.—Mr. H. G. Greenish has extracted from the bark of N. odorum two bitter principles, one soluble in chloroform and little soluble in water, to which he has given the name Neriodorin, and another very soluble in water and insoluble in chloroform, which he has named Neriodorein. Both of these substances are powerful heart-poisons. Neriodorein is an amorphous powder of a pale yellow colour, and very bitter taste, insoluble in petroleum spirit, ether, benzol, chloroform, sulphide of carbon, amylic alcohol, and acetic ether, but readily soluble in water and alcohol. It contains no nitrogen, a watery solution is neutral to test paper. Chloroform partly separates it from its watery solution in the form of an oily liquid. Chloroform and ether precipitate it from an alcoholic solution in a flocculent condition. It is soluble in glacial acetic acid, the evaporation of the solvent leaves a yellow amorphous varnish-like mass. Although the aqueous solution passes through the dialyser it has not been crystallised as yet. Concentrated sulphuric acid colours it of a brownish red, with a violet tinge round the edge of the mixture, gradually the mixture becomes yellow, passing to brown and green. In the presence of sugar strong sulphuric acid produces a brownish red colour passing to violet. Heated in a closed tube with 2 % of hydrochloric acid for two hours, neriodorein is decomposed into a yellow resinous substance; it appears to be a glucoside. Neriodorin is a transparent yellow, varnish-like substance which cannot be pulverized even after drying over sulphuric acid under the air pump; it is very soluble in chloroform, scarcely soluble in cold water, but much more so in hot water; its watery solution is bitter. It is insoluble in petroleum spirit, benzol and sulphide of carbon; ether only dissolves a trace. It is very soluble in alcohol, it contains no nitrogen, and is uncrystallisable. In other respects it closely resembles Neriodorein. (Phar. Jour., April, 23rd 1881.)

Cerbera thevetia, *Don., Bot. Mag.* 2309. The bark.

Vernacular.—Píla-kanír (*Hind.* and *Bomb.*), Pach-chai-alari, Tiruvach-chip-pu (*Tam.*), Kolkaphul (*Beng.*)

History, Uses, &c.—C. thevetia, also called Thevetia neriifolia, has large saffron-coloured flowers, bell-shaped, three-inches in length, and foliage much like that of the Oleander. It is commonly cultivated in tropical America as an ornamental garden shrub, and has been introduced into India, where it may frequently be seen in gardens. The milky juice of the tree is highly venomous. Its bitter and cathartic bark is reported to be a powerful febrifuge, two grains only being affirmed to be equal to an ordinary dose of cinchona. An oil has been extracted from the kernels of the nuts; it is of a clear bright yellow colour; its uses and properties have not yet been determined. In Bombay gardens the plant grows freely, and is usually pollarded a few feet from the ground to make it form a handsome bush, much like an English willow. There would be no difficulty in obtaining a good supply of the bark, as the trees are frequently cut; if collected from the young wood and dried it forms quills of about the thickness of cinnamon, externally dark grey with brown striæ, internally smooth and black; texture tough; taste bitter; no particular odour. The antiperiodic properties of the bark have been confirmed by Dr. G. Bidie (Madras Quart. Med. Journ., 1862, Vol. V., p. 178,) and Dr. J. Shortt (*Ibid.*, 1865, Vol. VIII., p. 294.) Their trials with it in various forms of remittent fever proved highly satisfactory, and leave little doubt that it is a remedy of considerable power. It was employed in the form of tincture (one ounce of the freshly-dried bark macerated for eight days in 5 ounces of rectified spirit) in doses of from 10 to 15 drops thrice daily. In larger doses (30 to 60 drops), it acts as an acrid purgative and emetic, and carried to a greater extent is evidently powerfully poisonous. The kernels are extremely bitter, and when chewed produce a slight feeling of numbness and heat in the tongue. The oil extracted from them is said by Dr. Shortt to be emetic and purgative. (Confer. Phar. of India, p. 138.)

Description.—The fresh bark of the young wood, of from ½ to 1 inch in diameter, is green, smooth and covered by a delicate grey epidermis, through which the green colour is apparent. The wood is white and soft, and there is a large central pith. All parts of the plant abound in milky juice, and have an acrid smell when bruised; sections of the bark examined under the microscope show many large laticiferous vessels arranged in bundles, which form a zone.

The fruits are slightly fleshy, and contain a hard stone, divided into two cells, each cell containing two slightly winged seeds, or the nut may be regarded as 4-celled, each of the two primary cells being partially redivided.

Dr. Kanny Lal Dey has drawn attention to the use of the seeds as a poison in Bengal, and Dr. Dumontier has published an account of the death of a child 3 years of age with symptoms of tetanus after eating one seed.

Chemical composition.—De Vry has obtained from the kernels of the seeds from 35·5 to 41 per cent. by expression and 57 per cent. with benzol of a limpid almost colourless oil. This oil had an agreeable mild taste like that of fresh almond oil; its density at 25° C. was 0·9148, and at that temperature it was perfectly liquid and transparent, at 15° C. it became pasty, and at 13° C. entirely solid. Oudemans found it to consist of 63 per cent. triolein and 37 per cent. tripalmitin and tristearin. After expression of the oil De Vry obtained from the cake about 4 °/₀ of a beautiful crystallised white glucoside, to which he gave the name of *thevetine*. A solution of 1·14 gram. of thevetine in glacial acetic acid to a volume of 10 cubic centimetres yielded in the polarimeter a levogyre rotation of 9·75°. With concentrated sulphuric acid thevetine yields a clear, dark yellow liquid, which by exposure to the air assumes after a few minutes a beautiful purple colour. This colour disappears after some time under separation of a flocculent matter. Nitric acid yields no reaction with thevetine at the ordinary temperature. De Vry has also found thevetine in the bark of the shrub. (For a further account of Thevetine, see a paper by Dr. Blas in the Transactions of the Académie des Sciences de Belgique (3) 2, No. 9—.) Warden, of Calcutta, has described a blue colouring principle contained in the seeds of Thevetia, which he attributes to the action of hydrochloric acid upon pseudoindican. (Confer. Phar Jour, Nov. 19th 1881, p. 417.)

Rauwolfia serpentina, *Benth., Bot. Mag., t.* 784; *Wight Ic., t.* 849; *Burm. Fl. Zeyl., t.* 64. The root

Syn.—Ophioxylon serpentinum.

Vernacular.—Chota-chánd (*Hind.*), Chandrá (*Beng.*), Harkai (*Bomb.*), Pátala-gandhi (*Tel.*)

History, Uses, &c.—This shrub is mentioned in Sanskrit works under the name of Sarpagandha. The Hindus use the root as a febrifuge, and as an antidote to the bites of poisonous reptiles, also in dysentery and other painful affections of the intestinal canal. By some it is supposed to cause uterine contraction and promote the expulsion of the fœtus. Ainslie gives the following account of it:—“Tsjovanna amelpodi is the name given, on the Malabar Coast (Rheede Mal. VI. 81, t. 47,) to a plant, the bitter root of which is supposed to have sovereign virtues in cases of snake bites and scorpion stings ; it is ordered in decoction, to the extent of a pint in twenty-four hours, and the powder is applied, externally, to the injured part. The plant is the radix mustela of Rumphius. (Amb. VII. 29, t. 16.) The Javanese class it among their anthelmintics, and give it the name of *pulipandak*. It may be found noticed both by Burman in his Thesaur. Zeylan (t. 64) and Garcia ab Horto, the latter recommends it as stomachic; Rumphius speaks of it as an antidote to poisons ; and Bontius, in his Hist. Mat. Med. Ind., tells us that it cures fever." (Mat. Ind. II. 441.) In the Phar. of India its use in labours to increase uterine contractions is noticed upon the authority of Dr. Pulney Andy, but we have no evidence of its efficacy in such cases. In Bombay most of the labourers who come from the Southern Concan keep a small supply of the root, which they value as a remedy in painful affections of the bowels. In the Concan the root with Aristolochia indica (Sápsan) is given in cholera, in colic 1 part of the root with 2 parts of Holarrhena root and 3 parts of Jatropha Curcas root is given in milk, in fever the root with Andrographis, ginger and black salt is used. The dose of the combined drugs in each case is from 3 to 4 tolás.

Description.—Root crooked, tapering, from ½ an inch in diameter downwards; bark soft, corky, marked by longitudinal fissures, light brown ; wood brittle, showing rings and medullary rays visible to the naked eye ; taste very bitter ; odour of the fresh root acrid.

Microscopic structure.—The suber upon transverse section presents the appearance of a piece of honeycomb, *viz.*, alternate rows of long tubular cells and compressed scales; the inner portion of the bark consists of a delicate parenchyma, loaded with starch, and traversed by indistinct medullary rays. The wood is remarkably starchy.

The root is not an article of commerce.

Allamanda cathartica, *Linn., Bot. Mag.,* 338 ; *Vernacular*—Jaharísontaka* (*Bomb.*), is said to have been introduced into India from Brazil by the Portuguese. It has become quite naturalized and in some places has run wild. Though not used in India it has a medicinal reputation, the leaves being considered a valuable cathartic in moderate doses, especially in the cure of painter's colic, in over doses it is said to be violently emetic and purgative. Ainslie has a short notice of the plant, and mentions its use at Surinam by the Dutch as a cathartic. It is a beautiful climbing shrub very common in Bombay gardens. The leaves are elliptic, lanceolate, and arranged in fours, round the stem, on very short petioles. The flowers are large, yellow and funnel-shaped, and are borne at the ends of the branches. The fruit is globular, the size of a small walnut, armed with long spines ; it contains several flat seeds with a membranous margin ; the plant seldom fruits in India.

Carissa Corandas, *Linn., Roxb. Cor. Pl. i., t.* 77 ; *Wight Ic., t.* 426 ; *Lam. Ill., t.* 118. The root.

Vernacular.—Karonda, Karaunda (*Hind.*), Karwand, Karinda (*Bomb.*), Karamcha (*Beng.*), Kalaka (*Tam.*)

History, Uses, &c.—This very common shrub, called in Sanskrit Karamardaka, is remarkable for its white jasmine-like flowers, which have a powerful odour, and for its purple black fruit, which unripe is so much used by Europeans for preserving. The natives also use the unripe fruit for pickling ; it is described in native works on Materia Medica as astringent, and the ripe fruit as cooling, acid, and useful in bilious conditions. The root has a reputation as a bitter stomachic, but I have no experience of its use. It is used as a plaster in the Concan to keep off flies, and pounded with horsepiss, limejuice, and camphor as a remedy for itch.

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* Jahari, poisonous, and Sontaka, a well-known Indian flower (Hedychium coronarium) of a yellow colour.

Description.—Roots long, brown, and scabrous, wood very close-grained and tough. The greater part of the bark consists of enormous stony cells, often more than an inch in length, flat and closely packed together, forming a network round the wood, through the interstices of which the soft parenchyma comes in contact with the cambium layer. The odour of the root is disagreeable, and the taste acrid and slightly bitter.

The fruit in size, shape, color and taste is not unlike a damson.

Plumeria acutifolia, *Poiret., Wight Ic., t.* 471 ; *Bot Mag., t.* 3952.

Vernacular.—Khairchampa, Dolochápo. The leaves made into a poultice are used to dispel swellings ; the milk is used as a rubefacient in rheumatic pains ; and the blunt ended branches are used to procure abortion. (S. Arjun, Bombay Drugs.) Dr. Hove, who found it growing abundantly on Malabar Hill, Bombay, in 1787, says that the inhabitants use it in intermittents as we do Cinchona. The Persians call it Aachín, and recommend it in gonorrhœa. In the Concan the bark is given as a remedy for diarrhœa with cocoanut, ghi and rice. The flower buds are eaten with Betel leaves in ague, and the juice with sandal wood oil and camphor is used to cure itch.

Cerbera Odollam, *Gärtn. Fruct. ii., t.* 124 ; *Wight Ic., t.* 441 ; *Rheede Hort. Mal. i., t.* 39.

De Vry has separated from the seeds a crystalline poisonous glucoside, probably the same as that found in C. Thevetia. (*Vide* C. Thevetia.)

Vinca pusilla, *Murr. in Act. Goett.*, 1772, 66, *t.* 2, *f.* 1; *Rheede Hort. Mal. ix.*, *t.* 33.

Vernacular.—Sangkhi, Sangkhaphuli (*Sans.*) Common on the Coromandel Coast and in the Concan, Deccan and Upper India. It is the Kupa-veela of Rheede. The dried plant boiled in oil is rubbed on the loins in lumbago.

Description.—A small annual herbaceous plant, stem erect, quadrangular, glabrous; leaves narrow, lanceolate, rough on the margin; flowers very small, yellowish-white, appear in the rains, solitary in the axils of the leaves; follicles slender, 1½ inch long.

Azima tetracantha, *Lam., Ill. t.* 807; *Wight Ill. ii., t.* 152.

Syn.—Monetia barlerioides.

Vernacular.—Kántagúr-Kamai (*Hind.*), Trikánta-juti (*Beng.*), Sukkapát (*Dec.*), Sung-elley (*Tam.*), Kundali (*Sans.*) A thorny shrub, somewhat resembling the common furze of England, grows in abundance about Dharwar Fort, probably planted. The juice of the leaf is bitter, and is supposed to give relief in the cough which accompanies phthisis and asthma; the root is also said to have similar properties. The berries, which are white when ripe, are eaten; they are about the size of a pea, and appear to be quite wholesome. For a full description of the plant, confer. Roxb. Fl. Ind. III., 765.

ASCLEPIADEÆ.

Heimdesmus indicus, *R. Br., Wight Ic., t.* ~~5~~94; *Bentl. and Trim., t.* 174; *Rheede Hort. Mal. x., t.* 34. The root.

Vernacular.—Anantamul (*Hind., Beng.*), Uparsára (*Bomb.*), Nannari (*Tam.*)

History, Uses, &c.—Dutt informs us that in Sanskrit medicine Hemidesmus indicus and Ichnocarpus frutescens (Apocyneæ) are both called Sáriva, and are described under the name of Sárivadvaya, or the two Sárivas. They are often used together and are considered to have similar properties. When however Sáriva is used in the singular number, it is the usual practice to interpret it as meaning Ichnocarpus frutescens. (Hind. Mat. Med., p. 915.) Ichnocarpus frutescens is common in the southern part of the Presidency. The Hindus consider its roots and those of Hemidesmus to be demulcent, alterative, and tonic, and prescribe them in dyspepsia, skin diseases, syphilis, &c. They are generally combined with bitters and aromatics. (For original prescriptions, confer. Dutt.) Under the name of Nannari, Hemidesmus has long been in use in Southern India. In the Northern part of the Bombay Presidency its medicinal properties appear to be ignored, as though common everywhere in the neighbourhood of Bombay, it is never collected by the natives. In the more Southern parts of the Concan the milky juice is dropped into inflamed eyes; it causes copious lacrymation, and afterwards a sensation of coolness in the part. The root is tied up in plantain leaves and roasted in hot ashes; it is then beaten into a mass with cummin and sugar and administered with ghi as a remedy in heat or inflammation of the urinary passages. As a *lép* the root is applied to swellings. The authors of the Pharmacographia remark that there is an Indian root figured as Palo de Culebra by Acosta (Tractado de las Drogas de las Indias orientales, 1578, cap. LV.) which is astonishingly like the drug in question. He describes it, moreover, as having a sweet smell of melilot. The plant he says is called in Canarese Duda-sali. The figure is reproduced in Antoine Colin's translation, but not in that of Clusius. In Goa at the present day Hemidesmus root is to be found in all the shops; it is known to the Portuguese as Uperçao, an evident corruption of the Mahratta name. Ashburner in 1831 was the first to call the attention of the profession in Europe to its medicinal value, and in 1864 it was made official in the British Pharmacopœia. In India O'Shaughnessy found its diuretic action to be very remarkable; two ounces infused in a pint of water and allowed to cool was the quantity usually employed daily, and by such doses the discharge of urine was generally trebled or quadrupled. It also acted as a diaphoretic and tonic, and so increased the appetite that it became a most popular remedy in his hospital, the patients themselves entreating its administration and continuance. (O'Shaughnessy Dispensary, p. 456, Beng. Pharm., p. 279—301.) In 1868, Hemidesmus was made official in the Phar. of India. Lastly in 1874, it was described by Flückiger and Hanbury in their Pharmacographia.

Description.—The drug is found in commerce in India in the form of little bundles, which consists of the entire roots of one or more plants, often several feet long, tied up with a portion of the stem.

The root is cylindrical, tortuous, from 2-10ths to 7-10ths of an inch in diameter, seldom branched. The bark is transversely cracked and fissured longitudinally, of a dark brown colour, sometimes with a slight violet hue when viewed in a strong light; the wood is yellow and hard. The fresh or freshly dried root has a fine odour of tonka bean or melilot, and a sweet but slightly acrid taste.

Microscopic structure.—According to Flückiger and Hanbury, all the proper cortical tissue shows a uniform parenchyme, not distinctly separated into liber, medullary rays and mesophlœum. On making a longitudinal section, however, one can observe some elongated laticiferous vessels filled with the colourless concrete milky juice. In a transverse section, they are seen to be irregularly scattered through the bark, chiefly in its inner layers, yet even here in not very considerable number. They are frequently 30 mkm. in diameter and not branched.

The wood is traversed by small medullary rays, which are obvious only in the longitudinal section. The parenchymatous tissue of the root is loaded with large ovoid starch granules. Tannic matters do not occur to any considerable amount except in the outermost suberous layer. (Pharmacographia, p. 380.)

Chemical composition.—The aroma is supposed to be due to a body of the cumarin class. In the Phar. of India mention is made of a substance obtained by distilling the root with water; it is supposed to be a stearoptene. (Confer. Phar. of India, p. 457.)

Commerce.—In Southern India and Bengal the root is met with in commerce, but is often so old as to be quite worthless. In Bombay we have to make arrangements for its collection, which costs Re. ¼ per lb., owing to the difficulty of digging the roots in stony ground.

Calotropis gigantea, *R. Br., Wight Ill., t.* 155; *Griff. Ic. Pl. As., t.* 397, 398.

" **procera**, *R. Br., Wight Ic., t.* 1278; *Bentl. and Trim., t.* 176. The root, leaves and flowers.

Vernacular.—Ák, Madár (*Hind.*), Ákanda (*Beng.*), Ákra, Rúí (*Bomb.*), Erukku, Erukkam (*Tam.*)

History, Uses, &c.—The same Indian names are applied to both of these plants. Sanskrit writers however notice two varieties which are distinguished by the colour of their flowers, viz., *alarka* or white and *arka* or red. Dutt (Hindu Mat. Med.) gives us the following summary of the uses of the plant, extracted from Sanskrit works, chiefly that of Chakradatta:—" The root bark is said to promote the secretions and to be useful in skin diseases, enlargements of the abdominal viscera, intestinal worms, cough, ascites, anasarca, &c. The milky juice is regarded as a drastic purgative, and caustic, and is generally used as such in combination with the milky juice of Euphorbia neriifolia. The flowers are considered digestive, stomachic, tonic and useful in cough, asthma, catarrh and loss of appetite. The leaves mixed with rock salt are roasted within closed vessels, so that the fumes may not escape. The ashes thus produced are given with whey in ascites and enlargements of the abdominal viscera. The following inhalation is prescribed for cough: Soak the powdered root bark of Arka in its own milky juice and dry. Bougies are then prepared from the powder, and their fumes inhaled. The root bark, reduced to a paste with sour conjee, is applied to elephantiasis of the legs and scrotum. The milky juices of C. gigantea and Euphorbia neriifolia, are made into tents with the powdered wood of Berberis asiatica, for introduction into sinuses and fistula in ano. The milky juice is applied to carious teeth for relief of pain." An oily preparation (Arka taila) made by boiling together 8 parts Sesamum oil, 16 parts Calotropis juice, and one part turmeric, is said to be useful in eczema and other eruptive skin diseases. In the Concan the milk with powdered mustard is applied as a *lép* to rheumatic swellings, the flowering tops pounded and boiled with molasses, are given in doses of about 1 drachm every morning as a remedy for asthma. In want of of virility the following prescription is in vogue: Take 125 of the flowers, dry and powder, then mix with 1 tolá each of cloves, nutmegs, mace and pellitory root, and make into pills of six massas each. One pill may be taken daily dissolved in milk.

In Western India, and probably elsewhere, there is a curious superstition that a leaf of the Akra fetched from the tree with certain ceremonies is of use in tedious labour. The friends of the woman take a packet of betelnut and leaf and a piece of money, and proceed to the plant, which they address in the most respectful manner, placing the betel packet at its root and asking for the loan of one of its leaves, which they promise to return shortly. They then take away a leaf and place it upon the head of the parturient woman, where it remains for a short time, and is afterwards returned to the plant. This practice appears to be connected with the worship of Márútí, which is popular in this part of the country. He is the god of wind, and was born from a pinda under the shelter of an Ákra tree. The tree is considered sacred to him, as it afforded him protection when all the other trees had been destroyed.

Mahometan writers describe it under the Arabic name of Ushar and say, "In Persian it is called Khark, in Greek Hejákiyus." Mír Muhammad Husain gives a good description of the plant, and notices the use of the silky cotton of the pods by the wandering Arabs and Tartars to make their Makhad twist or Yálish (tinder). He says there are three varieties,—1*st,* a large kind with white flowers, large leaves, and much milky juice, it is found near towns and the habitations of man; 2*nd,* a smaller kind with smaller leaves, the flowers white externally but lilac within; 3*rd,* a still smaller plant, with pale yellowish green flowers. The second and third kinds grow in sandy deserts. The properties of all three are similar, but the first kind is to be preferred, as it produces the largest quantity of milk. The juice is described as caustic, a purge for phlegm, depilatory, and the most acrid of all milky juices. Tanners use it to remove the hair from skins. Medicinally it is useful in ringworm of the scalp, and to destroy piles; mixed with honey it may be applied to aphthæ of the mouth; a piece of cotton dipped in it may be inserted into a hollow tooth to relieve the pain. Hakím Mír Abdul Hamíd, in his commentary upon the Tuhfat, strongly recommends it in leprosy, hepatic and splenic enlargements, dropsy and worms. A peculiar method of administration is to steep different kinds of grain in the milk and then administer them. The milk itself is a favourite application to painful joints, swellings, &c., the fresh leaves also, slightly roasted, are used for the same purpose. Oil in which the leaves have been boiled is applied to paralysed parts; a powder of the dried leaves is dusted upon wounds to destroy excessive granulation and promote healthy action.

All parts of the plant are considered to have valuable alterative properties when taken in small doses. Lastly, some of our Mahometan writers give very exaggerated accounts of the poisonous properties of the plant. C. procera was observed in Egypt by Prosper Alpinus (1580-84), and upon his return to Italy was badly figured, and some account given of its medicinal properties. (De plantis Ægypti Venet, 1592, cap. 25.) A much more correct figure was published in 1638 by his commentator Vesling. C. gigantea was figured by Rheede in 1679 (Hort. Malabar II., tab. 31). Ainslie, in his Materia Medica of Hindustan (1813), mentions two kinds of Calotropis, and in the Materia Indica he says, " both plants in their leaves and stalks contain much milky juice which, when carefully dried, is considered as powerfully alterative and purgative, and has been long used as an efficacious remedy in the Koostum (lepra Arabum) of the Tamools; the dose about the quarter of a pagoda weight in the day, and continued for some weeks. The root of the Yercum has a bitter and somewhat acrid, or rather warm taste; it is occasionally given in infusion as a stimulant in low fever. Of the other variety, the vullerkoo, the bark is warmish, and when powdered and mixed with a certain portion of margosa oil, is used as an external application in rheumatic affections. In the higher provinces of Bengal the Arka (C. gigantea) is supposed to have antispasmodic qualities. Mr. Robinson has written a paper on elephantiasis, which may be seen in Vol. X. of the Medico Chirurgical Society, extolling the madar root (Yercum vayr) as most efficacious in that disease, as also in venereal affections. In elephantiasis he gave it in conjunction with calomel and antimonial powder, in a pill, consisting of half a grain of calomel, three of antimonial powder, and from six to ten of the bark of the madar root, every eight hours. Mr. Playfair has also written a paper on the same root which may be seen in Vol. I. of the Edin. Med. Chirurg. Trans., p. 414, wherein he speaks in praise of the alterative, stimulant, and deobstruent virtues of the bark, or rather rind below the outer crust of the root, reduced to fine powder, in cases of syphilis, lepra, hectic fever, &c., dose from grs. 3 to 10 or 12, three times in the day, gradually increasing it. Messrs. Robertson, Playfair, and others seem chiefly to dwell on the virtues of the rind or bark of the root; but I must observe, that in lower India, where I was for many years, I found the simple dried milky juice considered as infinitely more efficacious; and later communications from the East confirm me in this opinion." (Mat. Indica, Vol. I., p. 487.) The emetic properties of madar were first brought to the notice of the profession by Dr. Duncan in 1829 (Edin. Med. & Surg. Journ., Vol. XXXII., p. 65); they are noticed in the Bengal Dispensatory, where the drug is recommended as a substitute for Ipecacuanha. Since the publication of that work abundant testimony in its favour has been collected, a summary of which will be found in the Pharmacopœia of India. Duncan made a chemical examination of the root bark, the activity of which he referred to an extractive matter which he termed Mudarine. A kind of Gutta-percha was obtained from the juice of this plant by Dr. Riddell, Superintendent Surgeon H. H. the Nizam's Army, in 1881. In 1853 it was examined by Prof. Redwood, who found it to possess many properties in common with the Gutta-percha of commerce. No further trial of this substance appears to have been made during the last 30 years.

Sakkar-el-Ushar.—This substance is described by Arabian and Persian writers as a honey dew which falls upon the plant in Khorasan and Arabia, and concretes into little grains like salt. Its taste is at first sweet and astringent, afterwards bitter; there are two kinds, *Yamani* and *Hejazi*, the first is white, the second brown; Calotropis Manna has an aperient action, and is valued in chest affections; it is said not to cause thirst like other sweet substances; it is best administered in camel's or goat's milk, one ounce may be taken daily; it is also used as an eye-salve to improve the sight. The following is a summary from the Madd-el Kámús of what the Arabian Lexicographers say concerning this substance, when treating of Ushar:—" A large shrub of the kind called عضاة (I'dáh) having a sweet gum (Abu Hanifeh, The Sihah, The Obáb) and milk (Obáb) and broad leaves, growing up high (Abu Hanifeh) from the flowers and shoots of which (Abu Hanifeh, Kámús) or from the joints of the branches and from the places of the flowers whereof (Obáb) there comes forth a well known kind of sugar (Abu Hanifeh, Obáb, Kámús) in which is somewhat of bitterness (Obáb, Kámús) called سكر العشر Sakkar-el-Ushar.—Abu Hanifeh, Táj-el-Arús) or, this is a kind of red sugar, which falls like dew upon this tree; (Golius, from Ibn Ma'rúf and the Mujmal). Some have thrown doubts upon the existence of this Manna, but Dr. G. Watt has observed in the dry sandy basin of the Upper Barákar in Chutia Nagpur, the plants covered with small green insects and exuding a gummy liquid.

Description.—The root barks of C. gigantea and C. procera are similar in appearance. As collected in Bombay, where it is removed by a few blows with a hammer or piece of hard wood, madar bark occurs in short quilled pieces ⅛th to ⅕th of an inch thick. The outer surface is yellowish-grey, soft and corky, fissured longitudinally, and can be easily separated from the middle cortical layer, which is white, friable, and traversed by narrow brown liber rays. The taste is mucilaginous, bitter and acrid ; and the odour peculiar.

Microscopic structure.—In both kinds of root bark the suber consists of large thin-walled cells, generally polyhedral. The parenchyme of the middle cortical layer is loaded with starch, and contains some sclerenchymatous cells. The cells of the medullary rays also contain starch and crystals of oxalate of lime. In the middle layer are numerous laticiferous vessels, the contents of which are of a brown colour.

Chemical composition.—The authors of the Pharmacographia state, that by following the process of Duncan, 200 grammes of the powdered bark of C. gigantea yielded nothing like his mudarine, but 2·4 grammes of an acrid resin soluble in ether and alcohol. The latter solution reddens litmus ; the former on evaporation yields the resin as an almost colourless mass. When the aqueous liquid is separated from the crude resin, and much absolute alcohol added, an abundant precipitate of mucilage is obtained, and the liquid now contains a bitter principle, which after due concentration may be separated by means of tannic acid. Similar results were obtained by exhausting the bark of *C. procera* with dilute alcohol. The tannic compound of the bitter principle was mixed with carbonate of lead, dried, and boiled with spirit of wine. This after evaporation furnished an amorphous, very bitter mass, not soluble in water, but readily so in absolute alcohol. The solution is not precipitated by an alcoholic solution of acetate of lead. By purifying the bitter principle with chloroform or ether, it is at last obtained colourless. This bitter matter is probably the active principle of Calotropis ; we ascertained by means of the usual tests that no alkaloid occurs in the drug. The large juicy stem, especially that of *C. gigantea,* ought to be submitted to an accurate chemical and therapeutical examination, List's *asclepione* (Gmelin's Chemistry XVII., 368,) might then be sought for. (*Op. cit.,* 2nd Ed., p. 426.) Drs. Warden and Waddell (1881) commenced an examination of Madár root bark in Calcutta, and obtained a substance crystallizing in nodular masses, which they thought would prove to be the *Asclepione* of List (Gmelin's Handb. XVII., 368), but subsequently (1885), upon Warden continuing the investigation of the drug in the Chemical Laboratory of the Gesundheits Amt, Berlin, he found the substance supposed to be asclepione to have a composition corresponding with the formula $C^{17} H^{28} O$, whereas List's asclepione is represented by the formula $C^{20} H^{34} O^{3}$.

The white cauliflower masses of crystals obtained in Berlin were found to agree closely, as regards their melting point and behaviour with solvents, with a substance called *Alban* obtained by Payen from gutta-percha (Jahresbericht über die Fortsch. der Chimie, 1852, p. 643), they were accordingly named *Madar-alban.* A yellow resin associated with madar-alban in the drug was found to agree, in behaviour with reagents, with the *Fluavil* found by Payen in gutta-percha, but as regards chemical composition the madar-alban and madar-fluavil differed from the alban and fluavil of gutta-percha. Dr. Warden also separated from the drug a *yellow bitter resin,* which is probably the active principle, and *Caoutchouc.*

He found the percentage of the various principles (the results being calculated on the bark containing 8·079 per cent. of water) to be—

Madar-alban	0·640
Madar-fluavil..	2·471
Black acid resin	0·997
Caoutchouc free from M.-alban and M.-fluavil.	0·855
Yellow bitter resin (active principle)	0·093

The fact that the sap of the Madár plant contains in addition to Caoutchouc two principles analogous to the alban and fluavil of gutta-percha is a point of some interest, as madár gutta-percha has been recommended as a substitute for the commercial article. For full particulars of the chemical examination, see Pharm Journ., Aug. 22nd, 1885.

Commerce.—The flowers are to be found in some of the Bombay shops, but not the root bark, or leaves, no doubt from the circumstance that the plant is everywhere found wild and can be collected as required.

Tylophora asthmatica, *W. & A., Wight Ic., t.* 1277; *Bentl. and Trim., t.* 177. The root and leaves.

Vernacular.—Jangli-pikwan, Antamul (*Hind.*), Antomul (*Beng.*), Nachchuruppan, Nay-palai, Peyp-palai (*Tam.*), Pitmári, Kharakí-rásna (*Bomb.*)

History, Uses, &c.—The medicinal properties of this plant appear to have been long known to the natives of those parts of India in which it occurs. But I can find no evidence of its ever having been an article of commerce, nor am I aware of its having been described in any of the standard Hindu or Mahometan works on Materia Medica, but no doubt some of the Shestrums of Southern India contain an account of it. Roxburgh says of it:—" On the coast of Coromandel, the roots of this plant have often been used as a substitute for Ipecacuanha. I have often prescribed it myself, and always found it answer as well as I could expect Ipecacuanha to do; I have also often had very favourable reports of its effects from others. It was a very useful medicine with our Europeans who were unfortunately prisoners with Hyder Ali during the war of 1780-83. In a pretty large dose it answered as an emetic; in smaller doses, often repeated, as a cathartic, and in both ways very effectually. Dr. Russell was informed by the Physician General at Madras (Dr. J. Anderson) that he had many years before known it used, both by the European and native troops, with great success in the dysentery which happened at that time to be epidemic in the camp. The store of Ipecacuanha had it seems been wholly expended, and Dr. Anderson finding the practice of the native doctors much more successful than his own, acknowledged with his usual candour that he was not ashamed to take instruction from them, which he pursued with good success; and collecting a quantity of the plant which they pointed out to him, he sent a large package of the roots to Madras. It is certainly an article of the Hindu Materia Medica highly deserving attention." (Flora Indica II., 34, 35.) Ainslie (Mat. Ind. II., 83,) informs us that the Vytians prize the root for its expectorant and diaphoretic properties, and often prescribe it in infusion to the quantity of half a teacupful for the purpose of vomiting children who suffer much from phlegm. From possessing virtues somewhat similar to those of Ipecacuanha it has been found an extremely useful medicine in dysenteric complaints, and has, at times, been administered with the greatest success by the European practitioners of Lower India. It would appear that this perennial plant is not found in Bengal, but is a native of the Northern Circars and of Ceylon. More recently we have the testimony of O'Shaughnessy and Kirkpatrick to the value of the drug as an emetic, and as a substitute for Ipecacuanha in the treatment of dysentery, and the opinion of these physicians is confirmed by the reports furnished to the Committee who superintended the preparation of the Phar. of India, by Drs. Bidie, Oswald, Sheriff and others. Tylophora is also employed in Mauritius, where it is known as Ipeca sauvage or Ipeca du pays. In the Indian Pharmacopœia the leaves have been made official. In the Concan 1 to 2 tolás of the juice are given as an emetic; it is also dried and made into pills which are administered in dysentery. The pills are as large as the seed of Phaseolus mungo; one pill is sufficient to produce one copious stool.

Description.—The leaves are opposite, entire, from 2 to 5 inches long, ¾ to 2½ inches broad, somewhat variable in outline, ovate or subrotund, usually cordate at the base, abruptly acuminate or almost mucronate, rather leathery, glabrous above, more or less downy beneath with soft simple hairs. The pedicel which is channelled is ½ to ¾ of an inch in length. In the dry state the leaves are rather thick and harsh, of a pale yellowish green; they have a not unpleasant herbaceous smell, with but very little taste. The root consists of a short, knotty, descending root stock, about ⅛ of an inch in thickness, emitting 2 to 3 aerial stems, and a considerable number of wiry roots. These roots are often 6 inches or more in length by ½ a line in diameter, and are very brittle. The whole drug is of a pale yellowish brown; it has no considerable odour, but a sweetish and subsequently acrid taste. In general appearance it is suggestive of valerian, but is somewhat stouter and larger. (Pharmacographia, p. 383.)

Chemical composition.—A concentrated infusion of the leaves has a slightly acrid taste. It is abundantly precipitated by tannic acid, by neutral acetate of lead or caustic potash, and is turned greenish-black by perchloride of iron. Broughton of Otacamund obtained from a large quantity of leaves a small amount of crystals—insufficient for analysis. Dissolved and injected into a small dog they occasioned purging and vomiting. (Pharmacographia, 2nd Ed., p. 427.)

Tylophora fasciculata, *Ham. in Wight Contrib.* 50; *Ic., t.* 848. *Vern.*—Bhui-dori. Abundant in the Southern Concan, it is used as a poison for rats and other vermin. Dr. Lyon records a case in which it proved fatal to man (1879). Erect or scarcely twining, glabrous; leaves approximated, ovate, rather obtuse, rather fleshy, decreasing in size upwards; peduncles erect, flexuous, bearing at the flexures 2 to 3 few flowered fascicles; follicles large, smooth. As this plant has very active properties its physiological effects should be investigated.

Gymnema sylvestre, *R. Br., Wight Ic., t.* 349. The root and leaves.

Vernacular.—Mera-singí (*Hind., Beng.*), Kavalí, Wakandi (*Bomb.*), Shiru-kurunja (*Tam.*)

History, Uses, &c.—This shrubby climbing plant is called by Sanskrit writers Meshasringi, and is in repute amongst the Hindus as a remedy for snake bite, the powdered root being applied to the part bitten, and a decoction of it being administered internally. Its use for this purpose is well known to the natives of the Concan, and as appears from Ainslie (Mat. Ind. II., 390,) also to the natives of Southern India. The root is also said to have virtues similar to Ipecacuanha. Roxburgh describes the plant under the name of Asclepias geminata, and remarks that the small yellow flowers, with the globular apex of the white common stigma, projecting in the centre, look like fine pearls set in gold. He says nothing of its medicinal properties. G. sylvestre is said to be the *binnuge* of the Cingalese. A curious circumstance connected with this plant was first noticed by Mr. Edgeworth, namely, that if chewed it destroys the power of the tongue to appreciate the taste of sugar and all saccharine substances. I am unable entirely to confirm this statement, my experience being that sugar taken into the mouth after chewing the fresh plant has a saltish taste, but is still easily recognizable. (Confer. Phar of India, p. 143.) In the Concan the dried and powdered leaf is used as an errhine.

Description.—G. sylvestre occurs sparingly in the neighbourhood of Bombay, it is more plentiful upon the Ghauts. In the Goa territory it is very abundant, even close upon the seashore. It is a shrubby climbing plant. The leaves are from 4 to 5 inches long, from ovate-lanceolate to obovate ; upper surface dark green, shining, under surface pale green, shortly pubescent ; venation transverse and reticulate with a marginal vein ; taste saltish and acrid. The root is about the size of the little finger or less, not unlike Hemidesmus ; it has a tough wood, and when fresh a soft spongy bark, which is reddish brown and fissured longitudinally, but loses much bulk in drying, and becomes loose and transversely fissured ; the taste is acrid and saltish ; the whole plant abounds in milky juice.

Microscopic structure.—The woody portion of the root has a radiate structure, and is transversed by large vessels ; the extension of the medullary rays into the bark is distinct; the latter is made up of a thin-walled parenchyma, the cells of which contain much starch and tolerably numerous crystalline concretions. There are many laticiferous vessels, especially towards the inner part. The epidermis consists of several layers of flattened cells of a deep reddish brown colour.

Dœmia extensa, *R. Br.*, *Wight Ic.*, *t.* 596; *Jacq. Ic. Pl. Rar.*, *t.* 54; *Hook. f. in Bot. Mag.*, *t.* 5704. The leaves.

Vernacular.—Útran (*Hind.*), Velip-parutti, Uttámani (*Tam.*), Útarní (*Bomb.*)

History, Uses, &c.—This very common twining Asclepiad is used by the natives as an emetic and expectorant, especially in the diseases of children. It is noticed by Ainslie under the name of Cynanchum extensum, who tells us that a decoction of the leaves is given to children as an anthelmintic, and that their juice is ordered in asthma. From the Phar. of India we learn on the authority of Dr. Oswald that it is used as an expectorant in the treatment of catarrhal affections, in ten grain doses, at the Pettah Hospital, Mysore. In Western India the plant has a general reputation as an expectorant and emetic. In Goa the juice of the leaves is applied to rheumatic swellings.

Description.—The leaves are roundish, cordate, acuminate, pubescent, membranaceous, auricled at the base, glaucous beneath. They vary in size from one to two inches or more in diameter. The peduncles are long, slender and hoary; odour mousy, and peculiar; taste faintly bitter and somewhat nauseous; examined with a lens both the upper and under sides of the dry leaf present a green mossy surface, thickly studded with short white hairs. The flowers are dull white and drooping; the follicles have a curved beak, and are covered with soft bristles.

Dregea volubilis, *Benth., Wight Ic., t.* 586; *Rheede Hort. Mal. ix., t.* 15. *Syn.*—Hoya viridiflora. The Harandorí of the Mahrattas, and Tita-kunga of Bengal, described by Ainslie under the Tamil name of Kodic-palay, has very similar properties to Dœmia extensa. The roots and tender stalks nauseate and excite expectoration, and the leaves are much employed as an application to boils and abscesses. D. volubilis is a large scandent shrub; readily distinguished by its drooping umbels of green flowers. The follicles are three or four inches long, and as many in circumference at the thickest part. They are covered with a brown mealy substance which the Bombay cowkeepers give to their cattle as medicine. All parts of the follicle are intensely bitter. The leaves are 3 to 4 inches long, ovate or cordate, acuminate, smooth on both sides, petioles 1 to 2 inches long. The plant is mentioned in the secondary list of the Pharmacopœia of India.

Asclepias curassavica, *Linn., Bot. Reg., t.* 81, although not a native of India, requires a short notice, as it is common in gardens and in some places has run wild. The plant is herbaceous, and has a woody branching root with light brown bark and numerous fibres. The bark is thin and when fresh exudes a milky juice; taste bitter and somewhat acrid. A section of the root bark placed under the microscope shows from without inwards—1*st*, a suberous layer; 2*nd*, several rows of large cells containing conglomerate raphides, with starch and granular matter; 3*rd*, a vascular zone, two or three large dotted vessels being situated at the cambium end of each medullary ray where it projects into the bark. A. curassavica is employed in the West Indies as an emetic. The juice of the flowers is said to be a good styptic. The local name of the plant in Bombay is Kúrki, it may be easily recognised by its oleander-like leaves, and red and orange flowers in terminal bunches. The follicles are like radish pods. Dr. Guimaraës (1881) described the physiological action of A. curassavica. He found it to act directly upon the organic muscular system, and especially upon the heart and blood vessels, causing great constriction of the latter and distension of the larger arteries. Secondarily it occasioned great dyspnœa, vomiting and diarrhœa. (*Times and Gazette,* December 1881, p. 661.)

Chemical composition.—Dr. Gram (Archiv. exp. Path. u. Pharm. xix., 384,) has found the plant to contain an active principle of a glucosidal character, which he has named *asclepiadin,* and appears to consider a purer form of the *asclepiadin* of Harnack and the *asclepion* of Feneulle. This substance was yellowish, amorphous, and when freshly prepared very soluble in water; but either in solution or in a dry state it quickly decomposed, sugar being separated, and the residual compound becoming in proportion insoluble in water and inert. From an ethereal solution crystals gradually separated out, apparently identical with List's *asclepione,* and quite inactive physiologically.

The physiological action of the unaltered *Asclepiadin* was found to closely resemble that of emetin, but in view of the instability of the compound, Dr. Gram doubts whether it can be advantageously introduced into medicine.

Holostemma Rheedii, *Wall., Pl. As. Rar. ii.,* 51; *Wight Ic., t.* 597; *Rheede Hort. Mal. ix., t.* 7; Tultuli, Sidori, Dudurli (*Bomb.*), is a twining, glabrous shrub, with ovate cordate leaves, and pretty, red and white, exquisitely perfumed flowers, very common in hedges in the Concan. The roots are used as a remedy for scalding in gonorrhœa, and beaten into a paste are applied to the eyes in ophthalmia. In diabetes the root rubbed to a paste is given in cold milk. In spermatorrhœa the dried root with an equal quantity of the root of Eriodendron anfractuosum powdered, is given in 6 massa doses, with milk and sugar, twice daily.

Ceropegia bulbosa, *Roxb., Cor. Pl. i.* 11, *t.* 7.

Vernacular.—Khappar-kadu. The starchy, somewhat bitter, tubers are used as a nutritive tonic in the bowel complaints of children. It is a twining glabrous fleshy plant with bulbous roots; the tubular corolla is of a violet colour within. Shepherds are fond of eating the tubers, which they consider to be tonic and digestive.

LOGANIACEÆ.

Strychnos Nux-vomica, *Linn., Gärtn. Fruct. ii., t.* 179; *Bedd. Fl. Sylv., t.* 243; *Bentl. and Trim., t.* 178. The bark and seeds.

Vernacular.—Kuchila (*Hind.* and *Beng.*), Kájra (*Bomb.*), Ettikkottai (*Tam.*)

History, Uses, &c.—No mention of Nux-vomica occurs in the older Sanskrit works, but it is quite possible that some part of the tree may have been used by the country people from a very early date, as we find the wood in common use as a tonic in Western India at the present time.

Dutt, in his Hindu Materia Medica (p. 198), has the following remarks:—"There is no generally recognised Sanskrit name for it (Nux-vomica). In some recent Sanskrit compilations it is mentioned under its vernacular name Kurchila, a term which is not to be found in standard Sanskrit dictionaries. Sarangadhara and other writers give some prescriptions containing a drug named Vishamushti, which is generally interpreted to mean in these places Nux-vomica seeds; but Vishamushti, according to the Bhávaprakása, has an edible fruit, and is called Kareruá in Hindi. In the last mentioned work the Sanskrit term Kupilu, with its synonyms Kulaka, Vishatinduka, Markatatinduka, &c., is said to be the Sanskrit for Kuchila; and this interpretation is followed in some Hindi medical books, as for example in the treatise on the properties of drugs, compiled by Pundit Keshava Prasáda Dvivedi, of the Agra College. This interpretation, however, is not accepted in Bengal, for neither Wilson nor Sir Raja Rádhakunta Deva has given Kuchila as the vernacular for Kupilu, nor does this term or any of its synonyms above mentioned, occur in any Sanskrit medical prescription." Nux-vomica is thought by some to have been introduced into medicine by the Arabians, but I very much doubt whether the Syrian and Arabic names under which the drug is described in more modern Arabic and Persian works really belong to it. An inspection of the older Arabian writers makes it I think pretty clear that the names Azáraki, Kátil-el-kalb, and Khánik-el-kalb refer to some other poisonous plant.* Amongst modern writers the author of the Makhzan-el-Adwiya describes S. nux-vomica very exactly under the head of Azáraki (Indian synonyms Kuchila and Kachúla). With regard to its medicinal use he recommends great caution, but says that it is of service in palsy, relaxation of the muscles and tendons, debility and chronic rheumatism. It may be applied externally and given internally in doses of from 1 to 2 dangs. He concludes by saying that much information about the drug will be found in Hindu works.

Ainslie writes of it as a little used drug; he rightly states that the pulp is poisonous, and Hanbury has confirmed this statement by showing that it contains strychnia. He also tells us that the Vytians are of opinion that if the seeds are not taken in sufficient quantity to cause death they will produce mental derangement. The Tamools powder it and mix it with Margosa oil; they give it in minute doses as a tonic and astringent, and recommend it in chronic rheumatism; with white of egg they employ it as a repellent. Rheede says that the root is given in snake-bite on the Malabar Coast. I am inclined to think that the Indian Mahometans have derived their knowledge of the drug from the Hindus. In Bombay the wood is quite a popular remedy among the vegetarians when they require a tonic; it is sold in short lengths with the bark attached, under the name of Goagarí lakri, but it is here necessary to remark that there are two kinds of Goagarí lakri found in the bazars, the true and the false; the former is the stem or root of S. colubrina, and will be described further on. It is the lignum colubrinum of old writers, and the Pao de Cobra of the Portuguese. In the Concan small doses of the seeds are given with aromatics in colic, and the juice of the fresh wood (obtained by applying heat to the middle of a straight stick to both ends of which a small pot has been tied) is given in doses of a few drops in cholera and acute dysentery. That Nux-vomica seeds were not an article of commerce at an early period is evident from the fact that Garcia d'Orta, an observer well acquainted with the drugs of the West Coast of India in the middle of the 16th century, makes no mention of them.

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* Azáraki is described as a bitter poisonous root, and Baghdádi describes Khánik-el-kalb as bearing pods like a bean which contain a number of hard small, black seeds; he says it is not the same as Azáraki.

Description.—The fruit is an indehiscent berry of the size and shape of a small orange, and of a rich orange-yellow colour; it is filled with a bitter gelatinous, white pulp, in which the seeds, from 1 to 5 in number, are placed vertically in an irregular manner. The seed is disc-like or rather irregularly orbicular, a little less than an inch in diameter, by about a quarter of an inch in thickness, slightly concave on the dorsal, convex on the ventral surface, or nearly flat on either side, often furnished with a broad, thickened margin, so that the central portion of the seed appears depressed. The outside edge is rounded or tapers into a keel-like ridge. Bombay Nux-vomica usually has a bevelled margin, and Madras an obtuse one. Each seed has on its edge a small protuberance, from which is a faintly projecting line (raphe) passing to a central scar which is the hilum or umbilicus; a slight depression marks the opposite side of the seed. The seeds are of a light greyish hue, occasionally greenish, and have a satiny or glistening aspect, by reason of their being thickly covered with adpressed, radiating hairs. Nux-vomica is extremely compact and horny, and has a very bitter taste. (Pharmacographia, p. 385.) The wood occurs in the shops in pieces of variable length, and from $\frac{3}{4}$ to 1 inch or more in diameter; it is covered by a thin light brown bark, which on one side of the stem is rougher than on the other, and is marked by numerous small light-coloured elliptic corky warts. A transverse section of the wood shows numerous very fine medullary rays; touched with nitric acid the section is stained a dull orange red.

Microscopic structure.—The hairs of Nux-vomica are of remarkable structure. They are formed as usual of the elongated cells of the epidermis, and have their walls thickened by secondary deposits, which are interrupted by longitudinally extended pores; they are a striking object in polarized light. The albumen is made up of large cells, loaded with albumenoid matters and oily drops, but devoid of starch. If very thin slices of Nux-vomica are kept for some time in glycerine, they develop feathery crystals, doubtless consisting of the alkaloids. (Pharmacographia, p. 385.) The corky layer of the bark is composed of cubical cells of a reddish brown colour; within this is a wide zone of thin-walled cells arranged in radial and at the same time concentric rows; then come several rows of light-coloured stone cells; and lastly, a tolerably wide layer of thin-walled cells in which a few stone cells are scattered.

Chemical composition.—The following summary is taken from the Pharmacographia:—"The bitter taste and highly poisonous action of Nux-vomica are chiefly due to the presence of strychnine and brucine. Strychnine, $C^{21} H^{22} N^{2} O^{2}$, was first met with in 1818 by Pelletier and Caventou in St. Ignatius Beans, and immediately afterwards in Nux-vomica. It crystallises from an alcholic solution in large anhydrous prisms of the orthorhombic system. It requires for solution about 6,700 parts of cold or 2,500 of boiling water; the solution is of decidedly alkaline reaction, and an intensely bitter taste, which may be distinctly perceived, though it contains no more than $\frac{1}{600000}$ of the alkaloid. The best solvents for strychnine are spirit of wine or chloroform, it is but very sparingly soluble in absolute alcohol, benzol, amylic alcohol, or ether. The alcoholic solution deviates the ray of polarized light to the left. Strychnine is not restricted to the fruit of the plant under notice, but also occurs in the wood and bark. It is, moreover, found in the wood of the root of Strychnos colubrina, *L.*, and in the bark of the root of Strychnos Tieute, *Lesch.*, both species indigenous to the Indian Archipelago. The discovery of Brucine was made in 1819 by the same chemists, in Nux-vomica bark, then supposed to be derived from Brucea ferruginea. Its presence in Nux-vomica and St. Ignatius Bean, was pointed out by them in 1824. Brucine dried over sulphuric acid has the formula $C^{23} H^{26} N^2 O^4$, but it crystallises from its alcoholic solution with $4 H^2 O$. It readily neutralises acids, forming crystalline salts. In bitterness and poisonous properties, as well as in rotatory power, it closely resembles strychnine, differing however in the following particulars:—it is soluble in about 150 parts of boiling water, melts without alteration a little above 130° C. In common with its salts, it acquires a dark red colour when moistened with concentrated nitric acid. By heating brucine with hydrochloric or sulphuric acid in sealed tubes, it is entirely decomposed, and then, according to Baudrimont (1869), yields among other products sugar."

The proportion of strychnine in Nux-vomica appears to vary from $\frac{1}{4}$ to $\frac{1}{2}$ per cent. That of brucine is variously stated to be 0·12 (Merck), 0·5 (Wittstein), 1·01 (Mayer) per cent.

A third crystallisable base, called *Igasurine*, was stated in 1853 by Desnoix, to occur in the liquors from which strychnine and brucine had been precipitated by lime. Schutzenberger's investigations (1858) are far from proving the existence of "igasurine."

In Nux-vomica as well as in St. Ignatius' beans the alkaloids, according to their discoverers, are combined with strychnic or igasuric acid; Ludwig (1873), who prepared this body from the latter drug, describes it as a yellowish brown amorphous mass, having a strongly acid reaction and a sour astringent taste; and striking a dark green with ferric salts.

Nux-vomica dried at 100° C. yielded us when burnt with soda lime 1·822 per cent. of nitrogen, indicating about 11·3 per cent. of protein substances. By boiling ether we removed from the seeds 4·14 per cent. of fat. Meyer found it to yield butyric, capronic, caprylic, caprinic, and other acids of the series of the common fatty acids, and also one acid richer in carbon than stearic acid.

Nux-vomica also contains mucilage and sugar. The latter, which according to Rebbling (1855), exists to the extent of 6 per cent., reduces cupric oxide without the aid of heat. When macerated in water, the seeds easily undergo lactic fermentation, not however attended with decomposition of the alkaloids. The stability of strychnine is remarkable, even after ten years of contact with putrescent animal substances.—(*Op. cit.*, 2nd. Ed., p. 430.) W. R. Dunstan and F. W. Short discovered (1884) a new glucoside in the pulp of the fruit of Strychnos Nux-vomica to the extent of 4 to 5 per cent., and named it *Loganin* This substance answers to the formula $C^{25} H^{34} O^{14}$. They have also shown that loganin is present in small quantity in the seeds and in preparations made from them. (Conf. Pharm. Journ., 3rd Series, XIV., 1025.)

Commerce.—Large quantities of Nux-vomica are exported from India. The annual exports from Bombay amount to about 4,000 cwts., all shipped to the United Kingdom. Madras and Cochin export still larger quantities, and Calcutta rather less. Value, Rs. 2 per maund of 37½ lbs. Bombay Nux-vomica is preferred by the manufacturers of strychnia, as its yields the largest quantity of alkaloid. Quite recently (1883), Professor Bentley has drawn attention to this fact as affecting the strength of the extract, stating that he had suffered serious personal inconvenience from the variation in strength of extracts prepared from different kinds of seed. Messrs. Dunstan and Short have estimated the amount of alkaloid contained in five samples of commercial Nux-vomica with the following results :—No I., 2·92 °/₀ ; No II., 3·57 °/₀ ; No III., 3·32 °/₀ ; No. IV., 3·38 °/₀ ; No. V., 2·56 °/₀. (Phar. Journ., Feb. 17th, 1883).

Collection.—Bombay Nux-vomica is collected in the Southern Concan ; as soon as the fruit is ripe it is attacked by birds and flying foxes, who eat the red outer rind and throw down the broken fruit; the seeds are then collected with little trouble, washed, and sold to the Bunnia for 2 annas a maund (28 lbs.)

Note.—The leaves of Polypodium quercifolium growing on Strychnos nux-vomica (*Vern.*, Básingh,) enter into a compound medicine for Phthisis. These leaves are very large and deeply notched.

Strychnos potatorum, *Linn. fil., Roxb. Cor. Pl. i., t.* 5; *Wight Ill. ii., t.* 156; *Gärtn. Fruct i., t.* 179. The seeds.

Vernacular.—Nirmali (*Hind., Beng.,* and *Bomb.*), Tetrankottai (*Tam.*), Niwali (*Mar.*)

History, Uses, &c.—This seed, in Sanskrit Kàtaka or Ambuprasada, has been in use in India from the earliest ages for the purpose of clearing muddy water. It is mentioned by Susruta in his chapter on water. One of the seeds is usually rubbed hard for a short time round the inside of the earthen pot, and the water is afterwards poured into it and left to settle; the impurities subside and the water remains clear and tasteless. Medicinally nirmali rubbed down with honey and camphor is applied to the eyes to strengthen the sight and prevent lacrymation; it is also used in ulceration of the cornea and purulent discharge from the conjunctiva. (Confer. Chakradatta) Mahometan writers tell us that it is cold and dry, that when applied externally to the abdomen it relieves colic; they also notice its use to strengthen the sight and as a remedy in snake-bite. The author of the Talíf-i-sharífí recommends it in irritation of the urinary organs and gonorrhœa. He directs four of the seeds to be powdered and mixed with a little curd of milk, to be tied up in a piece of cloth and steeped in water during the night. The infusion is to be taken in the morning. Ainslie says:—"The fruit, though when very young it is made into a preserve and eaten, is reckoned in its mature state amongst the emetics of the Tamool doctors in Southern India; given in powder in the quantity of about half a teaspoonful." The *clearing nut* has a place in the secondary list of the Pharmacopœia of India, and is there said to be used as remedy in diabetes on the authority of Kirkpatrick. A suggestion is also made that the nut would be of use if supplied to troops marching in the rainy season, when little but muddy water can be procured.

Dr. Pereira. (Pharm. Journ., 1850, Vol. IX., p. 478,) suggests that the property of clearing water possessed by these seeds depends upon the albumen and casein which they contain. If the seeds be sliced and digested in water, they yield a thick mucilaginous liquid, which, when boiled, yields a coagulum (albumen), and by subsequent addition of acetic acid, it furnishes a further coagulum (casein). (Confer. Phar. of India, p. 146.)

Description.—The seed is nearly orbicular, button-shaped, about ½ an inch in diameter and ¼ inch thick; round the border is a slightly prominent ridge, which marks the junction of the two portions of albumen constituting the bulk of the seed; at one point a slight irregularity of the ridge marks the situation of the radicle, from this runs a faintly projecting line to the umbilicus, which is central and well marked, a hardly perceptible depression marks the opposite side of the seed. The teguments are yellowish grey and covered with fine silky hairs. The albumen horny but not quite so hard as that of Nux-vomica. The embryo consists of a club-shaped radicle and two delicate heart-shaped cotyledons. The albumen is tasteless.

Microscopic structure.—The hairs have a similar structure to those of Nux-vomica, and show the same play of colour with polarised light.

Strychnos colubrina, *Linn.*, *Rheede Hort. Mal. vii.*, *t.* 5. The root and wood.

Vernacular.—Nága-musadi (*Tel.*), Modira-caniram (*Mal.*), Kuchila-lata (*Hind.* and *Beng.*), Goagarí-lakrí (*Bomb.*), Kájar-wel (*Mar.*)

History, Uses, &c.—This scandent Strychnos is supposed to be the Arbor ligni colubrini of Rumphius, who states that it is used in Java as a febrifuge and anthelmintic, and also externally in certain skin diseases. Horsfield notices its use in cutaneous affections, and to alleviate the pain and swelling from confluent small-pox. Ainslie says that it is the Dand-el-sini or China Dand of Avicenna, but this must be incorrect, as a reference to the Kánún shows that Ibn Siná, speaking of Dand, says الصيني منه كالفستق (the Chinese kind is like a Pistachio-nut). His other two kinds are *Sanjarí* and *Hindí* described as like red castor seeds and spotted. The word Dand is Persian and has many different meanings.

Virey in his Histoire naturelle des Medicamens, p. 191, informs us that Bois de Couleuvre in an over-dose occasions tremors and vomiting, but mentions at the same time that in smaller doses it may be considered as a useful vermifuge, and be given also with advantage in obstinate quartan agues. Guibourt considers that S. colubrina yields the true lignum colubrinum, or Pao de Cobra of the Portuguese, but he is unable to decide whether the wood usually found in commerce is produced by this tree or by S. Nux-vomica. (Confer. Guibourt, Hist. Nat., Ed. 1869, Vol. II., p. 557.) Its claims as an antiperiodic have been examined by Dr. Berdenis Van Berkelow (Schmidt's Jahrbucher, May 24th 1866, and Brit. and For. Med. Chir. Rev., April, 1867, p. 527); and after a trial with it in twenty-two cases, quartan and tertian, he reports favourably of its action, and considers that from its cheapness it may advantageously be used as a febrifuge. In Bombay shops two kinds of lignum colubrinum (Goagari-lakri) are met with; the genuine and least common is the wood of S. colubrina, the other that of S. Nux-vomica; both are much used by the Hindus on account of their tonic properties in dyspepsia and malarious affections. In the dyspepsia of vegetarians, preparations containing strychnia are particularly efficacious. I usually prescribe the extract of nux-vomica in half grain doses, and find that it has all the virtues of the lignum colubrinum. In the Concan the fresh leaves of S. colubrina rubbed into a paste with the kernel of the cashewnut are applied to suppurating tumors.

Description—The smaller branches with the bark on, form the Goagari-lakri of the shops. The general structure of the bark resembles that of Nux-vomica, but it is of a rusty colour, and the small warts upon it instead of being pale are of a bright rusty brown. The pieces of wood vary in size and length, and are much more knotty and crooked than those of Nux-vomica. The texture of the wood is also closer, harder, and of a deeper colour; when touched with nitric acid it turns of a reddish orange.

Microscopic structure.—The bark is thicker than that of Nux-vomica, but resembles it in structure, with the exception that the zone of stone-cells is wider and more irregular, and the cells themselves are bright yellow, and larger. (See microscopic structure of Nux-vomica bark.)

Strychnos Ignatii, *Berg., Bentl. and Trim., t.* 179; *Berg. Charact., t.* xxx., *f.* 240. The seeds.

Vernacular.—Papíta (*Hind., Beng.,* and *Bomb.*), and Kayappankottai (*Tam.*)

History, Uses, &c.—These seeds have only been known in India in comparatively recent times, as is evident from their bearing the Spanish name Pepita in a corrupted form, and from their being spoken of in Indian works on Materia Medica as a new medicine introduced by Europeans. We may then conclude that they first reached India some time after the year 1570, when the Phillippines had been occupied by Spain. The earliest notice of the drug which I have met with in Indian works does not date back more than one hundred and fifty years. The seeds were first described in Europe by Ray and Petiver (Phil. Trans., 1699, XXI., 44, 87), from information furnished to them by the Jesuit missionary Camelli. Indian physicians describe Papíta as alexipharmic, and a useful remedy in cholera; they also give from 1 to 2 grains of the seed in asthma, dropsy, rheumatism, piles, &c. There is a lengthy account of it in the Talíf-i-sharífí, which the author informs us is chiefly compiled from European works.

Description.—St. Ignatius' Beans are about an inch in length, their form is ovoid, yet by mutual pressure it is rendered very irregular, and they are 3 to 4 or 5-sided, bluntly angular or flattish, with a conspicuous hilum at one end. In the fresh state they are covered with silvery adpressed hairs; portions of a shaggy brown epidermis are here and there perceptible on those found in commerce, but in the majority the seed shows the dull grey granular surface of the albumen itself. Notwithstanding the different outward appearance, the structure of St. Ignatius' Beans accords with that of Nux-vomica. The radicle however is longer, thicker, and frequently somewhat bent, and the cotyledons are more pointed. The horny brownish albumen is translucent, very hard, and difficult to split. The whole seed swells considerably by prolonged digestion in warm water, and has then a heavy, earthy smell. The beans are intensely bitter, and highly poisonous. (Pharmacographia, p. 388.)

Microscopic structure.—The hairs of the epidermis are of an analogous structure, but more simple than in Nux-vomica. The albumen and cotyledons agree in structural features with those of the same parts in Nux-vomica.

Chemical composition.—Strychnine exists to the extent of about 1·5 per cent.; the seed also contains 0·5 per cent. of brucine. Dried over sulphuric acid and burnt with soda-lime it yielded an average of 1·78 per cent. of nitrogen, which would answer to about 10 per cent. of albumenoid matter. (Pharmacographia, p. 388.)

Commerce.—The seeds sometimes reach Bombay from the East *viâ* Singapore, sometimes they are imported from Europe. Value, extremely variable.

GENTIANACEÆ.

Swertia Chirata, *Ham., Wall. Pl. As. Rar. iii., t.* 252; *Bentl. and Trim., t.* 183. The plant.

Syn.—Ophelia chirata.

Vernacular.—Chiráyata (*Hind.* and *Bomb.*), Chireta (*Beng.*), Shirat-kuch-chi, Nila-vembu (*Tam.*)

History, Uses, &c.—Chiráyata has long been an important article of the Hindu Materia Medica. It is mentioned by Susruta and other Sanskrit writers under the name of Kiráta-tikta, which means the bitter plant of the Kirátas, an outcaste race of mountaineers in the north of India. It is also called Anáryat tikta, or the bitter plant of the non-Aryans. Another Sanskrit name is Bhunímba or Ground-nim. The herb is much esteemed by the Hindu physicians on account of its tonic, anthelmintic and febrifuge properties, and is prescribed in masked forms of malarial fever in which the chief symptoms are dyspepsia and burning of the body; it is usually combined with aromatics, such as ginger and lemon grass. (For original Sanskrit prescriptions, see Dutt's Hindu Materia Medica, p. 200.)

Mahometan writers upon Indian drugs have identified Chiráyata with the Kasab-ed-daríra of the Arabs, which is described as a slender reed, like the pen-reed but smaller, bitter, strong smelling, and when broken showing a pith like a spider's web; it has been thought to be the Calamus aromaticus of Latin writers, which is described as a perfumed drug used in making aromatic powders. Guibourt was also of the same opinion, but the improbability of its being correct has been pointed out by Fée and Royle, and is now generally admitted. The author of the Makhzan-el-Adwiya gives at the end of his article upon Kasab-ed-darira the following short summary of the manner in which Chirata is used by the Hindu physicians:—

"They consider it to be cold and dry, light and flatulent; a remedy for colds and bilious affections, burning of the body, and the fever arising from derangement of the three humors which they call sanípát (fever with delirium)." The plant was first described by Roxburgh under the name of Gentiana Chirayita in 1814. Ainslie notices it, and remarks that it appears to be much used in Bengal; it was probably rather a scarce drug in Southern India in his time, as he says little about it. In England it began to attract attention about the year 1829; and in 1839 was introduced into the Edinburgh Pharmacopœia. It is now official in the British and Indian Pharmacopœias, and is generally accepted as a valuable bitter tonic. In Western India it has a reputation as a remedy for bronchial asthma and in some cases I have known it used with success.

Description.—The entire plant is collected when in flower, or more commonly when the capsules are fully formed, and tied up with a slip of bamboo into flattish bundles of about 3 feet long, each weighing when dry from 1½ to 2 lbs. The stem, 2-10ths to 3-10ths of an inch in thickness, is of an orange-brown, sometimes of a dark purplish colour; the tapering simple root, often much exceeding the stem in thickness, is 2 to 4 inches long and up to ½ an inch thick. It is less frequently branched, but always provided with some rootlets. In stronger specimens, the root is somewhat oblique or geniculate; perhaps the stem is in this case the product of a second year's growth, and the plant not strictly annual. Each plant usually consists of a single stem, yet occasionally two or more spring from a single root. The stem rises to a height of 2 to 3 feet, and is cylindrical in its lower and middle portion, but bluntly quadrangular in its upper, the four edges being each marked with a prominent decurrent line, as in Erythrœa Centaurium and many other plants of the order. The decussate ramification resembles that of other gentians; its stems are jointed at intervals of 1 to 3 or 4 inches bearing opposite semi-amplexicaul leaves or their cicatrices. The stem consists in its lower portion of a large woody column, coated with a very thin rind, and enclosing a comparatively large pith. The upper parts of the stem and branches contain a broad ring of thick-walled woody parenchyme. The numerous slender axillary and opposite branches are elongated, and thus constitute a dense umbellate panicle. They are smooth and glabrous, of greenish or brownish grey colour.

The leaves are ovate, acuminate, cordate at the base, entire, sessile, the largest one inch or more in length, 3 to 5 or 7-nerved, the midrib being strongest. At each division of the panicle there are two small bracts. The yellow corolla is rotate, 4-lobed, with glandular pits above the base; the calyx is one-third the length of the petals, which are about half an inch long. The one-celled bivalved capsule contains numerous seeds.

The flowers share the intense bitterness of the whole drug. The wood of the stronger stems is devoid of the bitter principles.

Chemical composition.—At the request of the authors of the Pharmacographia, a chemical examination of chiretta was made by Höhn under the direction of Professor Ludwig of Jena. The chief results may be thus described. Among the bitter principles of the drug, Ophelic Acid, $C^{13} H^{20} O^{10}$, occurs in the largest proportion. It is an amorphous, viscid, yellow substance of an acidulous, persistently bitter taste, and a faint gentian-like odour. With basic acetate of lead, it produces an abundant yellow precipitate. Ophelic acid does not form an insoluble compound with tannin; it dissolves in water, alcohol and ether. The first solution causes the separation of protoxide of copper from an alkaline tartrate of that metal.

A second bitter principle, Chiratin, $C^{26} H^{48} O^{15}$, may be removed by means of tannic acid, with which it forms an insoluble compound. Chiratin is a neutral, not distinctly crystalline, light yellow hygroscopic powder, soluble in alcohol, ether and in warm water. By boiling hydrochloric acid, it is decomposed into Chiratogenin, $C^{13} H^{24} O^{3}$, and Ophelic acid. Chiratogenin is a brownish, amorphous substance, soluble in alcohol but not in water, nor yielding a tannic compound. No sugar is formed in this decomposition.

These results exhibit no analogy to those obtained in the analysis of the European gentians. Finally Höhn remarked in chiretta a crystallisable, tasteless yellow substance, but its quantity was so minute that no investigation of it could be made. The leaves of chiretta, dried at 100° C., afforded 7·5 per cent. of ash; the stem 3·7, salts of potassium and calcium prevailing in both. (Pharmacographia, 2nd Ed., p. 437.)

Commerce.—Most of the chiretta of commerce is said to be collected in the Morung district of Nepal, and is packed in large bales which contain about 1 cwt. Bombay is supplied with the drug through Calcutta. It arrives in large quantities about the end of March, when a stock may be laid in at about 3 annas per lb. Latterly an inferior kind known as Mítha Kiráyata (Sweet Chiretta) has been very common in Bombay. It may be distinguished by the almost complete absence of the central pith which is found in the genuine drug and by its deficient bitterness. This spurious chiretta has been noticed in the London market, and is said to be the produce of S. augustifolia, *Ham.*

Swertia decussata, *Nimmo, Wight Ill., t.* 157, *bis f.* 3 *f.*
Syn.—Ophelia multiflora.

Vernacular —Silájít, is used in the Deccan as a substitute for chiretta. The whole plant is bitter, but the root is preferred, and is said by Dr. Broughton and others who have used it to be an excellent substitute for gentian. It is not an article of commerce, but is sold in the bazar at Mahableshwar under the name of Kaḍú, which simply means "bitter."

Description.—Stem quadrangular, 4-winged, ascending, densely leafy; leaves round, ovate; stem clasping, 5-nerved, mucronulate, glabrous, decussate; cymes many-flowered; calyx divisions lanceolate, acuminate; corolla white, 4-divided, segments ovate, elliptic, their rounded pits surrounded by long fringes; filaments united at the very base; capsules large, cylindrical, erect; seeds minute. Root of the diameter of a quill, giving off two or three rootlets, covered with a whitish-brown epidermis, when dry wrinkled longitudinally, white internally, and brittle.

Exacum bicolor, *Roxb., Wight Ic., t.* 1321; *Bot. Mag., t.* 4340. This and other species of the same genus are used as bitter tonics by the country people. (Confer. Phar. of India, p. 149.)

Description.—Herbaceous, erect, two feet high; stem quadrangular; leaves sessile, ovate lanceolate, acute, 5-nerved; cyme terminal, contracted; flowers, large, white, tipped with blue, they appear towards the end of the rains. Graham calls it the Wild Indian Cornflower, and says: —"This is a flower, though native of a lower world, worthy of the garden of Paradise." It grows abundantly on the pasture lands of the Concan between Panwell and Khandalla; also above the Ghauts.

Erythrœa Roxburghii, *G. Don. Vern.*—Luntak, a very delicate little plant from 4 to 10 inches high, appearing in cultivated ground after the rains. The root is small and fibrous, sparingly branched, the stem quadrangular and winged; lower leaves obovate-oblong, obtuse, those on the stem linear-acuminate; cymes dichotomous; flowers bright pink, starlike; capsules oblong, mucronate, $\frac{1}{4}$ of an inch long, dehiscing, 2-celled, covered by the long sepals, and inflated silver-paper-like tube of the corolla. The plant is a good bitter, and may be found useful occasionally when chiretta is not obtainable. (Confer. Pharmacopœia of India, p. 150.)

Enicostema littorale, *Blume in Hook. Comp. Bot. Mag. ii.* 249, *t.* 28; *Wight Ic., t.* 600. *Syn.*—Hippion orientale; *Vern.*—Chota kiráyata (*Hind.*), Mamíjwa (*Bomb.*), is common in moist situations in many parts of the country. In Western India it abounds in Guzerat, but is rare in the Concan. Where abundant it appears to be generally accepted as a useful bitter. According to Cleghorn it is much used by the natives of Madras as a stomachic, as in addition to its tonic properties, it is also somewhat laxative. (Indian Annals of Med. Sc., Vol. III., p. 272.) E. littorale is brought to Bombay from Guzerat along with other simples; the plant is collected when in flower and tied up in small bundles which contain a pound or more.

Description.—Six to eight inches high, stem ascending, simple, 4-sided, leafy from the base; leaves opposite, subsessile, linear-lanceolate, or oblong, 3-nerved; calyx with bracts, the lobes obtuse, longer than the capsule; flowers small, white, sessile in the opposite axils, do not fall when the plant is dried; taste strongly bitter.

Canscora decussata, *Roem. and Sch., Bot. Mag.* 3066. Several plants belonging to this genus are common in Western India, and possess more or less the bitter properties of the gentian order. One of them, C. decussata, R. et Sch. *Syn.*—Pladera decussata, *Roxb.*, Sankhapushpi and Dandotpala, (*Sans.*), Sankháhuli (*Hind.*), Dánkuni (*Beng.*), is mentioned in Sanskrit works as a laxative, alterative and nervine tonic. Chakradatta recommends the fresh juice of the plant to be given in doses of about an ounce in all sorts of insanity; he also prescribes it as a nervine tonic. (Confer. Dutt's Hind. Mat. Med., p. 201.)

Description.—Stem about a foot high, perfectly erect, four-sided, angles very sharp, or rather membrane-winged, smooth, ramous, branches always opposite, cross-armed, in other respects like the stem; leaves opposite, spreading, sessile, lanceolate, sharp-pointed, entire, smooth, 3-nerved, size various; flowers terminal and axillary, peduncled, the terminal ones three-fold, the axillary single, white; peduncles 4-sided; calyx large, 4-toothed, 4-sided, 4-winged; corol funnel-shaped, border irregular, 3-parted, the two upper segments equal and orbicular, the lower one 2-parted, with a deep groove, in the groove is lodged the fourth or large stamen; filaments four, inserted into the mouth of the tube, the lowermost longer than the other three; style single; stigma 2-cleft, segments recurved; capsule one-celled, many seeded.

Gul-i-gháfith or **gháfit.**—A species of Gentian which is described in the Burhán-i-Kátia as having long blue flowers, and being one span in height; the whole plant is very bitter. In Fretag's Arabic Dictionary it is translated as Eupatorium, which

Sprengel considers to be the Agrimonia Eupatoria, a plant which appears to agree with the description of ευπατώριον in Dioscorides. The description of Eupatoria given by the Arabians is different, According to them it is a downy plant, with long, broad, fleshy leaves, a hollow stem, and purple flowers; this would agree better with the Eupatorium cannabinum or Hemp Agrimony, a plant belonging to the Compositæ. Gháfit is a Persian name which appears to have been wrongly associated with the Eupatorion or Agrimony of the ancients; it is very bitter and doubtless possesses the medicinal properties of a gentian.

Description.—The Bombay drug, which is imported from Persia, consists of delicate, quadrangular flower stalks two to four inches in length, terminating when perfect in five flowers; one of these is terminal, the remaining four are in opposite pairs and on longish peduncles, with bracts as long as the peduncles. The corolla is funnel shaped, about 1 inch in length, erect, five-partite; calyx five-partite; stamens five, alternate with the corolline segments; style single; stigmas two; fruit three-fourths of an inch long, one-celled, containing numerous small seeds; calyx and corolla persistent. The lower portion of the plant is sometimes to be found; it has the leaves of a gentian.

The entire plant is from 6 to 8 inches high, and very bitter.

Commerce.—The drug is an article of regular import from Persia, and sells at from 2 to 3 annas a pound.

Jintiyana.—Under this name gentian root imported from Europe is sold in Bombay, and is generally accepted by the hakíms as representing the Gentiana of Pliny and Dioscorides.* Mahometan writers describe Jintiyana as having purplish flowers, and give Pakhánbed as the Hindi synonym. The Pakhánbed of Bombay is apparently the root of an Iris, and is quite distinct from Gentian. European gentian root is obtainable in the Bombay market for about Re. ¼ per lb.

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* Dios. iii., 3; Pliny 25, 7.

Stereospermum xylocarpum, *Wight Ic., t.* 1335—6; *Bedd. Fl. Sylv., t.* 70.

Syn.—Bignonia xylocarpa. The wood.

Vernacular.—Kursingh (*Bomb.*)

History, Uses, &c.—This tree is a native of the forests of Western India from Khandesh to Malabar. It was introduced by Dr. Andrew Berry into the Botanic Garden at Calcutta, and is minutely described by Roxburgh. It has also been figured by Wight. (Icones, Vol. IV., t. 1335-1336.) The natives by a rough process of the same nature as that by which tar is obtained from Pine wood, extract from the wood a thick fluid of the colour and consistence of Stockholm tar, which they use as a remedy for scaly eruptions on the skin.* Dr. Gibson appears to have been the first to draw attention to the use of this substance by the natives. From some trials which I have made with it, I conclude that its properties are similar to those of Pine tar.

Description.—The wood of B. xylocarpa is hard, but easily split; when sawn across it presents a yellow resinous surface; sections examined with the microscope show that the yellow colour is due to a solid resinous deposit in the pitted vascular system. The drug has exactly the odour, colour, and consistence of Stockholm tar.

Heterophragma Roxburghii, *D. C., Roxb. Cor. Pl. ii., t.* 145; *Vern.*—Waras (*Bomb.*), another of the Bignoniaceæ, yields a similar product. It is a large and very common timber tree.

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* Two globular earthen pots are used, the upper contains the wood in small pieces; it has a perforated bottom and is fitted with a cover, and is luted to the mouth of the lower pot. Cowdung cakes are then piled up round the two pots and set fire to.

Stereospermum chelonoides, *D. C., Wight Ic., t.* 1341; *Bedd. Fl. Sylv., t.* 72. The root and flowers.

Syn.—Heterophragma chelonoides.

Vernacular.—Pádal (*Bomb.*), Pádri (*Tam.*), Tagada (*Tel.*)

History, Uses, &c.—The pleasant-tasted root, as well as the fragrant flowers of this tree, are said by Ainslie to be prescribed by the Vytians in infusion as a cooling drink in fevers. Rheede, who speaks of the tree under the name of Padrie (Hort. Mal., pp. 47—48, t. 26), says that the juice of the leaves mixed with limejuice, is of use in maniacal cases. The dose of the infusion is about half a teacupful twice daily. (Ainslie Mat. Ind. II., 272.) This tree is sometimes confounded with H. suaveolens, the root and flowers of which are used in a similar manner. It is common on the Western Ghauts.

Description.—Trunk straight, of a great height and thickness. Bark thick, scabrous, brown. Branches very numerous, the inferior horizontal above, gradually becoming more and more erect to the top; leaves opposite, pinnate, with an odd one, about twenty inches long; leaflets opposite, short petioled, generally four pair, the inferior smallest, obliquely oval, pointed, sometimes slightly notched about the margins, when young downy, afterwards smooth, about 4 inches long by two broad; petioles about 9 inches long, channelled, smooth; stipules none; panicles terminal, the larger ramifications decussate, the smaller or terminal 2-forked, with a sessile flower in the cleft; peduncles and pedicels round, covered with oblong grey scabrous specks; bracts small, caducous; flowers pretty large, yellow, very fragrant; calyx 5-notched; nectary, a yellow fleshy ring surrounding the base of the germ; filaments, there is a fifth sterile one between the lower pair; anthers double; stigma two cleft; silique very long, slender, twisted; receptacle of the seeds spongy, white, with alternate notches on the sides for the seeds to lodge in. (Roxb. Fl. Ind., III., 106.)

Stereospermum suaveolens, *D. C., Wight Ic., t.* 1342.

Syn.—Bignonia suaveolens. *Sans.* Pátálá.

Vernacular.—Pád (*Hind.*), Párul (*Beng.*), Pahad (*Bomb.*), has similar properties, and is used in the same manner as H. chelonioides. It is chiefly of interest because the root bark is one of the ingredients of the Dasamula (*vide* Tribulus terrestris), and is consequently much used in Hindu practice. The tree is described by Sir W. Jones, V., p. 133), who gives *paral* as the Hindustani name, and by Roxburgh, whose description is as follows :—" Trunk tolerably erect, though not straight. Bark ash coloured, and somewhat scabrous. Leaves opposite, pinnate, with an odd one, from 12 to 24 inches long. Leaflets opposite, from two to four pairs, oval, with long bluntish, narrow points slightly serrate, having both sides downy while young, and when full grown not downy and feeling harsh ; the exterior pair and odd one about six inches long, by three or four broad ; the inferior pair, or pairs, smaller. Petioles swelled at the base, roundish, when old scabrous. Panicles terminal, composed of a few spreading branchlets ; the first and second pairs thereof opposite ; the superior dichotomous, with a solitary pedicelled flower in the forks ; all are downy, and somewhat viscid. Flowers large, of a dark, dull crimson colour, exquisitely fragrant. Calyx campanulate. Border 4-cleft ; upper divisions with two minute points, outside a little villous. Corol, throat ample, woolly, convex above, flat and plaited beneath. Border, the upper divisions shorter, erect ; the three inferior ones longer and projecting, with the margins of all much curled. Filaments 4 fertile, and between them a small sterile one. Anthers twin. Germ oblong, elevated on a glandular receptacle. Stigma 2-lobed."

Dolichandrone falcata, *Seem., Bedd. Fl. Sylv., t.* 71.

Syn.—Spathodea falcata.

Vernacular.— Mersinghí. This small tree has the reputation of being used to procure abortion. Any information about its use for this purpose will be acceptable.

Oroxylum indicum, *Vent., Wight Ic., t.* 1337; *Bureau Monogr. Bign., t.* 9; *Rheede Hort. Mal. i., t.* 43. The bark.

Syn.—Calosanthes indica.

Vernacular.—Arlú (*Hind.*), Násoná (*Beng.*), Tetú, Phalphura (*Bomb.*), Vanga-maram (*Tam.*)

History, Uses, &c.—This is a small tree, remarkable for its terminal spikes of large fleshy lurid flowers, which appear at the commencement of the rainy season, and are followed by very large, retrofracted, transversely compressed, somewhat curved pods, with the convexity upwards. The seeds are numerous, membranaceous, surrounded with a large, delicate, membranaceous wing. The leaves are supra-decompound, and from four to six feet long. The bark is of considerable importance in Hindu medicine, as it is an ingredient of the Dasamula (*vide* Tribulus terrestris); it is considered to be astringent, tonic and useful in diarrhœa and dysentery. In Bombay it is much used in veterinary practice as an application to the sore backs of bullocks; it is usually mixed with turmeric. Sarangadhara recommends the juice expressed from the roasted bark in combination with Mocharas (*vide* Bombax Malabaricum) as a remedy in diarrhœa and dysentery. He also says that the root bark boiled in Sesamum oil is a good application in otorrhœa. (Confer. Dutt's Hindu Mat. Med., p. 203.) The Sanskrit names of the plant are Syonáka and Aralu.

Dr. Evers informs us that the Gonds call the tree "jaimangal," and that they employ a decoction of the bark as a discutient application to rheumatic swellings. He says:— "I have made a trial of the powder and an infusion of the bark, and have found it to be most powerfully diaphoretic; the drug has slight anodyne properties; also a bath, prepared with the bark, I have frequently employed in rheumatism. Twenty-eight cases of acute rheumatism were treated with this drug, and in all the results have been most satisfactory. The dose of the powder is from 5 to 15 grains, thrice daily; of the infusion (1 ounce of bark to 10 ounces of boiling water) an ounce three times a day. Combined with opium it forms a much more powerful sudorific than the compound powder of ipecacuanha. The drug does not possess any febrifuge properties." (*Indian Medical Gazette*, Feb. and March, 1875.)

Description.—The bark is light brown, marked with the large rough scars of the fallen leaves, and also thickly studded with wart-like protuberances about the size of a pin's head; internal surface yellow when fresh. The minute structure does not call for remark, but upon placing a section under the microscope in a little water the whole field is seen to be filled with delicate needle-shaped crystals which have escaped from the cut cells of the parenchyma; in entire cells the crystals can be seen *in situ.* The bark is faintly bitter and a little acrid; it has no particular odour.

Crescentia Cujete, *Linn., Jacq. Amb.* 175, *t.* 111; *Plumb. Gen.* 23, *t.* 109.

The Calabash tree introduced from South America is now pretty well known in Bombay, and latterly I have observed the fruit being offered for sale by the herbalists as a pectoral in the form of a poultice of the pulp applied to the chest. In the West Indies a syrup is made from the pulp which is much used in dysentery and as a pectoral. The tree has oblong cuneate, often obovate, entire, shining leaves, and flowers variegated with green, purple, red and yellow. The fruit is large, gourd-like and green, it varies much in size, being from 2 inches to a foot in diameter.

Dr. Peckolt, of Rio Janeiro (Pharm. Rundschau, Aug. 1884), states that an alcoholic extract of the not quite ripe fruit in doses of 0·10 gram. acts as a mild aperient, and that 0·5 gram. proves strongly drastic, without griping or ill effects. As an application against erysipelas the fresh pulp is boiled with water until it forms a black paste to which vinegar is added, and the whole boiled together and spread upon linen. A chemical examination of the fresh pulp yeilded a new organic acid, crystallizing in plates, to which the name '*crescentic acid*' has been given. It was obtained by exhausting with water an alcoholic extract of the pulp, treating the aqueous solution with lead acetate, suspending the lead precipitate in water and decomposing and removing the lead, then evaporating to a syrupy consistence, and leaving it to crystallize in a cool place. Besides crescentic acid there were found tartaric, citric and tannic acids, two resins, a bitter and an aromatic extractive substance, and a colouring matter that appeared to resemble indigo.

PEDALINEÆ.

Sesamum indicum *D. C.*, *Wight Ill., t.* 163; *Bot. Mag., t* 1688; *Bentl. and Trim.*, t. 198. The leaves and seeds.

Vernacular.—Tíl (*Hind.* and *Beng.*), Tal, Tíl (*Bomb.*), Ellu (*Tam.*)

History, Uses, &c.—Dutt in his Hindu Materia Medica gives us the following account of Tila or Snehaphala:—"The word Taila, the Sanskrit for oil, is derived from Tila; it would therefore seem, that sesamum oil was one of the first, if not the first oil manufactured from oil seeds by the ancient Hindus. The Bhávaprakása describes three varieties of Til seeds, namely, black, white and red. Of these the black is regarded as the best suited for medicinal use; it yields also the largest quantity of oil. White Til is of intermediate quality. Til of red or other colours is said to be inferior and unfit for medicinal use. Sesamum seeds are used as an article of diet, being made into confectionery with sugar or ground into meal. They form an essential article of certain religious ceremonies of the Hindus, and have therefore received the names of *homdhanya* or the sacrificial grain, *pitritarpana* or the grain that is offered as an oblation to deceased ancestors, &c. Sesamum oil forms the basis of most of the fragrant or scented oils used by the natives for inunction before bathing, and of the medicated oils prepared with various vegetable drugs. It is preferred for these purposes from the circumstance of its being little liable to turn rancid or thick, and from its possessing no strong taste or odour of its own. Sesamum seeds are considered emollient, nourishing, tonic, diuretic and lactagogue. They are said to be especially serviceable in piles, by regulating the bowels and removing constipation. A poultice made of the seeds is applied to ulcers. Both the seeds and the oil are used as demulcents in dysentery and urinary diseases in combination with other medicines of their class." (*Op. cit.*, p. 216.)

Mahometan writers describe the seed under the Arabic name of Simsim. In Africa it is called Juljulán,* and in Persia Kunjad. The Mahometan bakers always sprinkle the seeds upon their bread, the sweetmeat-makers mix them with their sweets. The oil, which is called in Arabic Duhn-el-hal, is used for the same purposes as olive oil is in Europe. Sesamum is considered fattening, emollient, and laxative. In decoction it is said to be emmenagogue; the same preparation sweetened with sugar is prescribed in cough; a compound decoction with linseed is used as an aphrodisiac; a plaster made of the ground seeds is applied to burns, scalds, &c.; a lotion made from the leaves is used as a hair wash, and is supposed to promote the growth of the hair and make it black; a decoction of the root is said to have the same properties; a powder made from the roasted and decorticated seeds is called Ráhishi in Arabic and Arwah-i-Kunjad in Persian; it is used as an emollient both externally and internally.

Sesamum, (σήσαμον) is frequently mentioned by Greek and Latin authors, Lucian speaks of σησαμαῖος πλαχους, *til ke laddu.* (Pisc. 41.)

Sesame oil was an export from Sind to Europe by way of the Red Sea, in the days of Pliny. In the Middle Ages the plant was known as Suseman or Sempsen, a corruption of the Arabic Simsin or Samsim. It is now called by Europeans both in India and Europe Jinjili, which appears to be a corruption of the Arabic Juljulán. Jinjili or Gingeli oil is one of the most valuable of Indian vegetable oils; it keeps for a long time without becoming rancid. It is produced in large quantities in almost every part of the peninsula. The following mode of preparation is given in the Jury reports of the Madras Exhibition:—"The method sometimes adopted is that of throwing the fresh seeds, without any cleansing process, into the common mill, and expressing in the usual way. The oil thus becomes mixed with a large portion of the colouring matter of the epidermis of the seed, and is neither so pleasant to the eye nor so agreeable to the taste as that obtained by first repeatedly washing the seeds in cold water, or by boiling them for a short time, until the whole of the reddish brown colouring matter is removed, and the seeds have become perfectly white. They are then dried in the sun, and the oil expressed as usual. The process yields from 40 to 44 per cent. of a very pale straw-coloured sweet smelling oil, an excellent substitute for olive oil." In the Government Medical Store Laboratory at Bombay the oil is used in the preparation of plasters, but it requires a larger proportion of oxide of lead than groundnut oil. For liniments it appears to be a perfectly satisfactory substitute for olive oil. According to the Pharmacographia the oil extracted by ether had a sp. gr. of 0·919 at 23° C.

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* جلجلان That which is جليل (a thing) great in estimation. Ibn Abbád in Táj-el-Arús.

(2*nd*).—The fruit of Coriander, Siháh, Mughrib, Kámús.

(3*rd*).—Sesame, Siháh, Ez-Zamakhsherí, Mughrib, Táj-el-Arús, Sesame in its husk before it is reaped, Siháh. The grain of Sesame, Kámús.

(4*th*).—The heart's core. *Lane, Madd-el-Kamús.*

Description.—Annual, 2 to 3 feet; leaves opposite or upper ones alternate, ovate, oblong or lanceolate, the lower ones often 3-lobed, or 3-divided, feather-nerved; at the base of the peduncles are remarkable yellow glands; flowers solitary in the axils resembling those of the foxglove, from dirty white to rose-coloured, capsule velvetty and pubescent, mucronate, at first 2-celled, afterwards 4-celled; seeds numerous, without wings, ovoid, flat, white, brown, or black, rather smaller than linseed. S. Indicum has run wild on the Western Coast, and comes up every where on waste ground during the rains. The natives call it Jangli (wild) Tal or Tíl, the cultivated Tíl of the coast being Guizotia oleifera, or Ram-tíl.

Chemical composition.—The authors of the Pharmacographia say :—" The oil is a mixture of olein, stearin, and other compounds of glycerin with acids of the fatty series. We prepared with it in the usual way a lead plaster, and treated the latter with ether in order to remove the oleate of lead. The solution was then decomposed by sulphuretted hydrogen evaporated and exposed to hyponitric vapours. By this process we obtained 72·6 per cent. of Elaidic acid. The specimen of sesame oil prepared by ourselves, consequently, contained 76·0 per cent. of olein, inasmuch as it must be supposed to be present in the form of triolein. In commercial oils the amount of olein is certainly not constant.

"As to the solid part of the oil, we succeeded in removing fatty acids, freely melting after repeated crystallisations at 67° C., which may consist of stearic acid mixed with one or more of the allied homologous acids as palmitic and myristic. By precipitating with acetate of magnesium, as proposed by Heintz, we finally isolated acids melting at 52·5 to 53°, 62 to 63°, and 69·2° C., which correspond to myristic, palmitic and stearic acids.

" The small proportion of solid matter which separates from the oil on congelation, cannot be removed by pressure, for even at many degrees below the freezing point it remains as a soft magma ; in this respect Sesame oil differs from that of olive.

" Sesame oil contains an extremely small quantity of a substance, perhaps resinoid, which has not yet been isolated. It may be obtained in solution by repeatedly shaking five volumes of the oil with one of glacial acetic acid. If a cold mixture of equal weights of sulphuric and nitric acids is added in like volume, the acetic solution acquires a greenish yellow hue. The same experiment being made with spirit of wine substituted for acetic acid, the mixture assumes a blue colour, quickly changing to greenish yellow. The oil itself being gently shaken with sulphuric and nitric acids, takes a fine green hue, as shown in 1852 by Behrens, who at the same time pointed out that no other oil exhibits this reaction. It takes place even with the bleached and perfectly colourless oil. Sesame oil added to other oils, if to a larger extent than 10 per cent., may be recognised by this test. The reaction ought to be observed with small quantities, say, 1 gramme of the oil and 1 gramme of the acid mixture previously cooled."

Commerce.—The quantity of seed shipped from British India in the year 1871-72 was 565,854 cwts., of which France took no less than 495,414 cwts. In 1881-82, the exports from Bombay alone were 994,120 cwts., valued at Rs. 64,84,475. France continues to take about 4-6ths of the total exports. Besides this, 105,344 gals. of oil, value Rs. 1,12,122, were exported to eastern ports. In 1884-85, the exports from the whole of India were 2,654 thousand cwts. In Bombay the oil is usually obtainable for from Rs. 14 to 16 per cwt. The article known as Goratel in the bazar, and commonly used by the natives for culinary purposes, is usually a mixture of groundnut, sesamum, and carthamus oils; it may be used for plaster-making, but the proportion of oxide of lead will require adjustment, as the proportion of the different oils in the mixture often varies.

Pedalium murex, *Linn., Burm. Fl. Ind.* 139, *t.* 45, *f.* 2; *Gärtn. Fruct. i., t.* 58; *Wight Ic., t.* 1615. The fruit and leaves.

Vernacular.—Barra-gokhrú (*Hind.* and *Bomb.*), Peru-nerunji, Anai-nerunji (*Tam.*), Karonta (*Goa*).

History, Uses, &c.—This is a rather large, spreading, succulent plant, which is found all along the Western Coast. It is particularly abundant in Kattiawar and Guzerat, and appears to flourish best in sandy soil near the sea, coming up in the rains and fruiting in the cold weather. The dried fruits are the Barra-gokhrú of the shops, and have probably been in use from a remote period among the natives of India in the same manner as those of Tribulus terrestris, which are known as Chota-gokhrú. The fresh plant agitated in water or milk renders it very mucilaginous without materially altering the taste, colour, or smell of the liquid. This thickening disappears after some hours. A watery infusion of this kind sweetened with sugar is a favourite and excellent demulcent in acute gonorrhœa. A decoction of the fruit is considered to have similar virtues. In the Concan a *Paushtik* is made of the powdered fruit with ghi, sugar and spices; it is taken with milk. Mahometan writers do not appear to mention this plant, their greater Gokhrú or garden Hasak being Xanthium strumarium.

Dr. Emerson has observed that the juice is used as a local application to aphthæ.

P. murex is supposed by some to be the Faríd-bútí (herb Faríd), the plant upon which Shaik Faríd-ed-dín Shakar Ganj,* a Mahometan ascetic and poet, sustained life while he acquired the everlasting treasure of knowledge (Ganj-i-la-yazál-i-maárif). The following quatrain is attributed to him:—

Shabníst keh khún-i-dil-i-ghamnák naríkht. |
  Rúzí neh keh ábrú-i-man pák naríkht, ||
Yak sharbat-i-áb-i-khúsh nakhúrdam hameh 'umr. |
  Kán níz z'rah-i-dídeh bar khák naríkht. ||

By night I am consumed with grief,
  By day I am overwhelmed with shame,
No drop of sweet water passes my lips,
  But it pours in tears from my eyes.

European writers upon Indian drugs bear evidence to the correctness of the native estimate of the medicinal value of Gokhrú, and it has lately been introduced into European practise as a remedy for nocturnal seminal emissions, incontinence of urine and impotence. (*Practitioner*, XVII., 381.) It has been given in an infusion of 1 oz. of the fruit to 1 pint of boiling distilled water; this quantity should be taken daily.

Description.—A spreading, low, succulent plant with oval, dentate obtusely pointed leaves; pedicels axillary, 1-flowered, shorter than the petiole, 1 to 2, or more dark-brown glandular bodies situated near the axils; flowers yellow; tube of corolla about 1 inch long; fruit pendulous, about ½ an inch long, and ¼ inch in diameter at the base, four-angled, with a straight spine at the base of each angular ridge, above the spines is a narrow portion which is inserted into the 5-clawed calyx; when dry the fruit is corky, it is divided into two cells; the seeds are elongated, narrow, and four in number. The young branches, petioles, under-surface of leaves and immature capsules have a frosted appearance, which is due to the presence of numerous small, sessile, brilliant, crystalline, 4 to 5-partite glands. The substance of the fruit consists, in great part, of dense fibro-vascular tissue, forming a kind of 4-winged nut; the corky part consists of delicate cellular tissue; when fresh it is green and succulent. The fresh plant has a peculiar disagreeable musky odour. Simple agitation of the young branches in water, without any crushing, produces a viscid mucilage like white of egg. I find from experiment that the glandular crystalline bodies described above are the source of the mucilage; if they are gently scraped from the under-surface of the leaf and mixed with water, the viscidity is at once produced. The mucilage has a faint peculiar taste, but is not disagreeable.

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* Shakarganj or Sugar store, poison in his mouth became sugar—

سنگ در دست او گوهر گردید ∴ زهر درکام او شکر گردید ∴

His shrine is at Pák-pattan, or the Ferry of the Pure; he died A. H. 664, ninety-five years of age, Pák-pattan is in the Panjáb between Bahwalpúr and Firúzpúr in the Sutlej Valley.

Commerce.—The Bombay market is supplied with the dried fruit from Guzerat and Kattiawar. Value, Rs. 5 per Surat maund of 37½ lbs.

Martynia diandra, *Don., Bot. Rep.* 575; *Vern.*—Vinchú (*Bomb.*), is a native of Mexico, but has become quite naturalized in the neighbourhood of Bombay, making its appearance on waste ground during the rains. The plant is herbaceous, has large cordate leaves, and handsome flowers like those of sesame. The fruit is a green fleshy capsule which contains a hard, black, woody, wrinkled nut, with two anterior hooks, having something the appearance of a beetle. The natives liken it to a scorpion, hence the name Vinchú; they suppose it to have a curative effect upon the sting of that reptile, the nut being rubbed down with water and applied to the injured part. It is sold in the Bombay shops.

CONVOLVULACEÆ.

Ipomœa Turpethum, *R. Br., Bot. Reg., t.* 279; *Bot. Mag., t.* 2093. The stem and root.

Vernacular.—Nisot, Nakpatar, Pitohri (*Hind.*), Nishotar, Phútkari (*Bomb.*), Shivadai (*Tam.*), Teori (*Beng.*)

History, Uses, &c.—Sanskrit writers mention two varieties of Trivrit or Triputa, *viz.*, Sveta, white, and Krishna, black. The white kind only should be used, the black is said to be poisonous; it is not very clear what the black kind is. Nisot is one of the most common native cathartics, and has probably been in use all over India from a very early date. The usual method of administration is to rub down about a drachm of the root or stem with water, and add to it some rock salt and ginger, or sugar and black pepper. Under the name of *turbud,* Mahometan writers also mention two kinds, white and black, and direct the black to be avoided on account of its poisonous properties, which are said to resemble those of Hellebore. As regards its properties they say that it is a drastic purgative of phlegmatic humours and bile; its action is promoted by combination with ginger; it is particularly beneficial in rheumatic and paralytic affections. Combined with chebulic myrobalans it is useful in melancholy and dropsies. Ainslie tells us that "the Convolvulus Indicus alatus maximus had long a place in the British Materia Medica, but of late years has fallen into disuse. I find it mentioned by Avicenna under the name of Turbud; but the first among the Arabs who prescribed it was Mesue (see Spreng., Rei Herbariæ, Vol. I., p. 249), also Rhazes (c. 173). Alston in his Materia Medica speaks of turbith as a strong and resinous cathartic, and recommended in his days in gout, dropsy and leprosy. The plant is known to the modern Greeks by the name of τουρπεθ; it is a native of the Society and Friendly Isles, as well as of India, of the New Hebrides and of New Holland. Virey, in his Histoire Naturelle des Medicamens (p. 184), speaks of the root of the Convolvulus turpethum as more drastic than the common jalap, which, however, it does not seem, is to be found in India." (Mat. Ind. II., p. 384.)

Wallich, Gordon, and Glass considered this drug to be of considerable value as a cathartic. Sir W. O'Shaughnessy (Beng. Disp., p. 504), found it so uncertain in its operation that he pronounced it unworthy of a place in the Pharmacopiœa, but he does not give any particulars as to the method of administration he employed. Further experiments with the drug are required, as there seems to be no doubt of its efficacy in native hands. In Western India the flowers are offered to Shiva and are applied to the head in hemicrania.

Description.—The Turbith of commerce consists of the root and stem of the plant cut in short lengths, usually from ½ to 2 inches in diameter; the central woody portion is often removed by splitting the bark on one side. The exterior surface has a twisted rope-like or columnar appearance, and is of dull grey colour, a transverse section shows a porous surface of a dirty white colour, and loaded with pale yellowish white resin; through this substance pass numerous bundles composed of large vessels and woody fibre. The drug is free from smell, but has a nauseous taste, which is only perceptible after it has been some time in the mouth. In some specimens all or a portion of the central wood remains; it resembles a piece of rattan cane. Black nisot presents a similar apperance, but is of smaller size and of a darker colour.

Microscopic structure.—The epidermis consists of tabular brown cells; the parenchyma is starchy, in it are thickly scattered very large resin cells and numerous rosette-like raphides; the many large vascular bundles are composed of large dotted vessels surrounded by wood fibres, each of the prominent external ridges of the bark contains one of these bundles. The central cane-like woody column of the root or stem when present is seen to be divided into four parts by four bands of parenchyma (medullary rays); it consists of large dotted vessels connected together by narrow portions of woody fibre.

The black nisot has exactly the same structure as the white.

Chemical composition.—Turbith resin consists of a small quantity of soft resin soluble in ether, and of a substance insoluble in ether, benzine, sulphide of carbon, and essential oils. This substance has been named Turpethine, and is present in the root to the extent of 4 per cent.; it has been examined by Spirgatis, who describes it as a grey powder having a powerfully irritant action upon the mucous membranes of the mouth and nose, and being analogous in its reactions with jalapine and convolvuline. Under the action of alkaline bases it is transformed into turpethic acid, and in the presence of hydrochloric acid becomes converted into glucose and turpetholic acid. (Zeitschr. der Chemie und Pharmacie, 1865.)

Commerce.—The price of Turbith in Bombay is Rs. 2½ per maund of 37½ lbs.

Ipomœa hederacea, *Jacq., Bot. Mag., t.* 138; *Bentl. and Trim., t.* 185. The seeds.

Syns.—I cœrulea; Pharbitis Nil.

Vernacular.—Kálá-dánah, Mirchai (*Hind., Beng.* and *Bomb.*), Kodi-kakkatan-virai (*Tam.*)

History, Uses, &c.—These seeds do not appear to be noticed in Sanskrit works on Materia Medica. Under the Arabic name Hab-un-níl and the Persian name Tukm-i-níl, the author of the Makhzan-el-Adwiya correctly describes the shape of the seed, and colour of the flowers. As regards the medicinal properties of the drug he says that it is a drastic purgative and attenuant, relieving the system of bilious and phlegmatic humours, and acting as an anthelmintic. In some native works the seeds of Clitorea ternatea appear to be confounded with Káládánah. The author of the Makhzan, though describing the latter article correctly, gives Aprajita as the name of a kind of Hab-un-nil. The Tamil names for the two seeds are also very similar, and I think it is doubtful whether the Hindustani name Zirki is properly applied to this plant.

From the time of Roxburgh, and probably from an earlier date, the properties of the seeds have been known to Europeans, who have almost universally acknowledged their value as a safe and sure cathartic.

In the Pharmacopœia of India (1868) they were made official, and directions for preparing an extract, tincture, compound powder, and resin are given. These preparations are meant to supply the place of similar preparations of jalap. With regard to the extract, I may observe that no directions for separating the albumen and mucilage are given, consequently the result of the operation is an enormous bulk of almost inert extract, which in a short time becomes putrid. Five to ten grains of this extract have no perceptible effect as a purgative. The resin appears to be the most satisfactory preparation; of this the dose is from 4 to 8 grains.

Description.—The seeds resemble in shape those of most of the Convolvuli, being in the form of a segment of a sphere; they are generally about $\frac{3}{16}$ths of an inch in length, and nearly as much in breadth, but sometimes much smaller. Their weight varies from $\frac{1}{2}$ to nearly 1 grain. The colour of the testa is black, except at the umbilicus, where it is brown. Upon soaking the seeds in water the testa bursts and discloses the delicate albumen which envelopes the folded cotyledons and radicle. These have an acrid taste and earthy odour.

Microscopic structure.—From without inwards the testa consists of—1*st,* a layer of epithelial cells, the thick outer walls of which form conical projections; 2*nd,* a single layer of small quadrangular cells; 3*rd,* a layer of radially elongated prismatic cells; 4*th,* a zone of parenchyma, the cells of which are irregularly compressed. Within the testa is the thin layer of albumen, which contains much mucilage. The cotyledons are built up of polygonal cells; in their substance are cavities or passages which contain a yellowish oil.

Chemical composition.—The authors of the Parmacographia say :—" By exhausting the seeds dried at 100° C. with boiling ether, we obtained a thick light-brownish oil having an acrid taste and concreting below 18° C. The powdered seeds yielded of this oil 14·4 per cent. Water removes from the seeds a considerable amount of mucilage, some albuminous matter, and a little tannic acid. The first is soluble to some extent in dilute spirit of wine, and may be precipitated therefrom by an alcoholic solution of acetate of lead.

" The active principle of Kaladana is a resin, soluble in alcohol, but neither in benzol nor in ether. From the residue of the seeds after exhaustion by ether, treatment with absolute alcohol removed a pale yellowish resin in quantity equivalent to 8·2 per cent. of the seed. Kaladana resin, which has been introduced into medical practice in India under the name of Pharbitisin, has a nauseous acrid taste and an unpleasant odour, especially when heated. It melts at about 160° C. The following liquids dissolve it more or less freely, namely, spirit of wine, absolute alcohol, acetic acid, glacial acetic acid, acetone, acetic ether, methylic and amylic alcohol, and alkaline solutions. It is, on the other hand, insoluble in ether, benzol, chloroform, and sulphide of carbon. With concentrated sulphuric acid, it forms a brownish yellow solution, quickly assuming a violet hue. This reaction, however, requires, a very small quantity of the powdered resin. If a solution of the resin in ammonia after having been kept a short time is acidulated, no precipitate is formed ; but the solution is now capable of separating protoxide of copper from an alkaline solution of the tartrate, which orginally it did not alter. Heated with nitric acid, the resin affords *sebacic acid.*.

" From these reactions of Kaladana resin, we are entitled to infer that it agrees with the resin of jalap or Convolvulin. To prepare it in quantity, it would probably be best to treat the seeds with common acetic acid, and to precipitate it by neutralising the solution. We have ascertained that the resin is not decomposed when digested with glacial acetic acid at 100° C., even for a week.

"We have had the opportunity of examining a sample of Kaladana resin manufactured by Messrs. Rogers and Co., Chemists of Bombay and Poona, which we found to agree with that prepared by ourselves. It is a light yellowish friable mass, resembling purified jalap resin, and, like it, capable of being perfectly decolourised by treatment with animal charcoal." (*Op. cit.*, 2nd Ed., p. 449.)

Commerce.—Kaladanah is collected in different parts of the country; the plant is everywhere common during the latter part of the rainy season.

In Bombay the seeds of Ipomœa muricata, *Jacq.*, imported from Persia, are much more common than those of the true Kaladanah. They are accepted by the natives as Kaladanah. Value, Rs. 5 per maund of 37½ lbs.

Ipomœa Quamoclit, *Linn.*, *Rheede Hort. Mal. xi.*, *t.* 60; *Bot. Mag.*, *t.* 244.

Vernacular.—Vishnukrant (*Mar.*), Kámlata (*Hind.* and *Beng.*)

A native of America naturalized in India and named Kámalata, in Sanskrit (Cupid's flower), noticed by Sir W. Jones in his Asiat. Res. 4, p. 256. A small creeping plant, easily recognized by its filiform leaves and small bright crimson flowers which open in the morning, found in most gardens. Medicinally the Hindus consider it to have cooling properties, and apply the pounded leaves to bleeding piles, at the same time administering 1 tolá of the juice with an equal quantity of hot ghi twice a day internally. The crushed leaves are also used as a *lép* for carbuncles (kálpuḷi).

Ipomœa bona-nox, *Linn.*, *Convolv. Or.* 59, *t.* 1, *f.* 4.

Syn.—Calonyction speciosum.

Vernacular.—Gul-chandni (*Bomb.*), Patmapu-todami (*Sans.*), Naga-mooghatei-kai (*Tam.*)

The pericarpium of this species of convolvulus contains usually four seeds about the size of kidney beans, which are eaten when young. Dried these capsules and seeds, as well as the flowers, leaves and root, are amongst the medicines which are supposed to have virtues in snake-bites; the dose of the seeds is about three daily, administered in powder. (Ainslie.) The capsules have been sent to me from Poona as being in use there. In the Concan the juice of Rivea ornata, *Vern.*—Phánd, is made with Borneo camphor and butter into an ointment for pityriasis (Shéba). For piles one tolá of the juice with half a tolá of Babul pods and a little sugar, is given in a quarter seer of cow's milk every morning.

Description.—Stem sometimes prickly, climbing to a great height; leaves large, quite smooth, cordate, petioled, pointed; peduncles very long, 1 to 5-flowered; flowers very large, pure white, opening at sunset. A very variable plant. (*Bomb. Flora.*)

Ipomœa muricata, *Jacq., Hort. Schoenb. iii.* 40, *t.* 323; *Bot. Reg. iv., t.* 290, is the source of the Tukm-i-níl imported into Bombay from Persia. Roxburgh says of it:—"I have only met with this in my own garden; it was raised from seeds sent from Persia and proves annual." It is noticed by Graham who seems to regard it as a variety of Calonyction speciosum (Bombay Plants, No. 972). In Bombay it is common in gardens and upon waste ground, and it is a garden weed in many parts of the Concan, where it is known as *Bárik Bhauri,* or the lesser Bhauri, on account of the similarity of the calyx to that of Porana racemosa (Bhauri). The juice of the plant is used to destroy bugs. The Bombay plant is identical with the one I have obtained by sowing the Persian seed.

Description.—Annual, herbaceous, climbing; root small, tapering, with many slender rootlets; stem branched, covered with soft prickles, not hairy; leaves broadly cordate, acuminate, smooth, on long petioles; flowers axillary, 2 to 4, on long peduncles having prickles like the stem; pedicels large, fleshy and club-shaped, of a light green colour, 1½ inches long; calyx divided; sepals 5, broadly ovate, mucronate, smooth, persistent; corolla purple, about 2 inches in diameter, expanding at sunset, and closing before sunrise; capsule two-celled, composed of 4 segments, which separate from the central partition; cells two-seeded; seeds dark brown, smooth, the same shape as those of Kaladanah, about ⅓rd of an inch in length, and ¼ in breadth; weight about 3 grains each. They can easily be distinguished from Indian Kaladanah by their greater size, lighter colour and thick testa; their medicinal properties seem to be the same, but accurate observations are required. When exhausted with rectified spirit they yield a brown resin, and a yellowish oil having the same appearance as the resin and oil of the genuine article.

Ipomœa biloba, *Forsk. Bot. Reg.*, 319; *Rheede Hort. Mal. xi., t.* 57; *Syn.*—I. pescapræ; *Vern.*—Marjâdvel (*Bomb.*), Dopátilata (*Hind.*), Chhágal-kúrí (*Beng.*), is a perennial plant with a tough woody root of great length; it abounds in sandy ground near the seashore; from the enlarged crown of the root grow a number of creeping stems, fleshy and purplish when young, but becoming woody as they mature; the leaves are smooth, thick, long petioled, and two-lobed like those of the Bauhinias; the flowers large, and of a reddish purple. A section of the root shows in the central portion five wedge-shaped bundles of fibro-vascular tissue; external to these is a row of laticiferous vessels full of a viscid yellow latex, then again come a number of irregularly placed fibro-vascular bundles, and external to them another zone of laticiferous vessels. The parenchyme of the root contains starch and large conglomerate raphides. The whole plant is very mucilaginous. The leaves boiled are applied externally in rheumatism and colic, the juice is given as a diuretic in dropsy, and at the same time the bruised leaves are applied to the dropsical part.

Evolvulus alsinoides, *Linn., Lam. Ill., t.* 216, *f.* 2; *Wight Ill., t.* 168. *Syn.*—E. hirsutus. *Vern.*—Shankhávalli (*Bomb.*), Vishnugandhi (*Sans.*) The whole plant is used, it is believed, by the hakíms to strengthen the brain and memory, and is used extensively in the mofussil as a febrifuge and tonic. (S. Arjun.) It is in use in the Goa territory. According to Ainslie it is used in bowel complaints. In the Vedic period it was believed to promote conception.

Description.—A very small herbaceous plant, cespitose, procumbent, covered with adpressed hairs; leaves ovate-oblong, subsessile, less than ½ inch long; peduncles one-flowered, as long as the leaf or longer; flowers of a beautiful deep blue, very small. Common everywhere in grassy places. (*Bomb. Flora.*)

Ipomœa digitata, *Linn., Bot. Reg., t.* 62; *Bot. Mag.*, 1790. The root.

Syn.—Batatas paniculata.

Vernacular.—Billai-kand (*Hind.*), Bhui-kumra (*Beng.*), Bhuikohala (*Bomb.*), Matta-pal-tiga (*Tel.*), Phal-modecca (*Mal.*)

History, Uses, &c.—This plant is mentioned by the early Sanskrit writers on Materia Medica under the names of Vidari and Bhumiku-shmánda. The large tuberous root is considered tonic, alterative, aphrodisiac, demulcent, and lactagogue. In the emaciation of children with debility, and want of digestive power, the following diet is recommended:—"Take of Vidari, wheat flour and barley equal parts, and make into a confection with milk, clarified butter, sugar, and honey." Susruta gives several prescriptions for its uses as an aphrodisiac. The simplest is as follows:—"Macerate the powder of the root in its own juice, and administer with honey and clarified butter. Vidari enters into the composition of several diuretic and demulcent mixtures." (Confer. Dutt's Hindu Materia Medica, p. 205.) Rheede (Hort. Malab. II., p. 101-102,) notices the use of the root dried in the sun, powdered, and boiled with sugar and butter to promote obesity and moderate the menstrual discharge. In Bombay it is used medicinally for the above-mentioned purposes, and can always be obtained in druggists' shops. The plant is commonly cultivated in gardens on account of its handsome rose-coloured flowers, which appear in the rains. In the Concan the root is peeled and cut in small pieces and dried in the shade, it is then powdered and the powder repeatedly moistened (14 times) with the juice of the fresh root and dried. Half a tolá of this preparation may be taken daily in honey or milk as an aphrodisiac. From this powder a *Paushtik* is made by frying it in butter with equal parts of almonds, quince seeds, cloves, cardamoms, nutmegs, satawari, gokroo, seed of Mucuna pruriens, musli, &c., and making the whole into a conserve with sugar. This conserve is taken dissolved in milk in doses of half a tolá or more, as an aphrodisiac. In spermatorrhœa the juice is given with cummin and sugar.

Description.—The root is a simple or forked tuber, sometimes as much as 10 to 12 lbs. in weight, externally it is of a grey colour, and somewhat warty and scabrous. When a transverse section is made the cut surface is of a dirty white colour, and marked by concentric rings, which are formed by the vascular and laticiferous vessels; from the latter a viscid milky fluid exudes; the taste is astringent and somewhat acrid, not unlike raw potato.

Microscopic structure.—The bulk of the tuber consists of a starchy parenchyme. The vascular system is scalariform. The laticiferous vessels are most numerous towards the cortical part; raphides abound.

Commerce.—The tubers are sold by the herbalists, and are very extensively used in Bombay. The largest fetch about 2 annas. The young tapering tubers of a small variety of this plant form the Asgand of the bazars. (*Vide* Asgand.)

Ipomœa reniformis, *Chois.*, *Burm. Fl. Ind.* 77, *t.* 30, *f.* 1.

Vernacular.— Undirkáni. The plant has deobstruent and diuretic properties. (Bákir Ali.) The Hindus administer the juice in rat bite, and drop it into the ear to cure sores in that organ.

Description —Stem creeping and rooting; leaves kidney-shaped, waved, and dentate on the margin, obtuse; petioles hairy, peduncles very short, 1 to 2-flowered; corolla small, yellow. Common in places where water has lodged, flowers in the cold weather. (*Bomb. Flora.*) At a little distance the plant has the appearance of Hydrocotyle asiatica.

Ipomœa vitifolia, *Sweet.*, *Burm. Fl. Ind.* 45, *t.* 18, *f.* 1.

Vernacular.—Nawal (*Bomb.*)

Description, Uses, &c. A large, perennial climbing plant with cordate leaves, palmately 5-cleft; flowers large, of a bright sulphur colour, appearing mostly after the rains, and during the cold season; seeds very large, black. Plant common in gardens, wild in the Concan, where the juice is considered very cooling, and is given as a cooling medicine with milk and sugar. In inflammation of the eyes one tolá of the juice with one tolá of limejuice, half a tolá of opium, and one quarter tolá of Mamíran (Coptis root) is used as a *lép* round the orbit.

Argyreia speciosa, *Sweet.*, *Wight Ic.*, *t.* 851; *Smith Ic. Pict.*, *t.* 17; *Bot. Mag.* 2446. The root and leaves.

Vernacular.—Samandar-sokh (*Hind.*), Bijtarka (*Beng.*), Samudra-shokh (*Bomb.*), Shamuddirap-pach-chai (*Tam.*)

History, Uses, &c.—This large Convolvulus, the Lettsomia nervosa of Roxburgh, the Elephant-creeper of the English, and the Vriddhadáraka of Sanskrit medical writers, is extremely common in Western India. The root is by the Hindus regarded as alterative, tonic, and useful in rheumatic affections and diseases of the nervous system, the dose being about a drachm given in combination with aromatics. (For original Sanskrit formula, see Dutt's Hindu Mat. Med., p. 206.) The large leaves, which have the under-surface covered by a thick layer of silky hairs, afford a kind of natural impermeable piline, and are used as a maturant by the natives. With regard to the alleged blistering properties of the upper surface of the leaf there must be some mistake, as I find it has no effect when applied to the skin.

Description.—Leaves heart-shaped, 9 to 12 inches long and 8 to 10 broad, or even larger; upper surface dark green and smooth, under-surface white and silky from the presence of a felted layer of long simple hairs. Under the microscope these are seen to be simple tubes gradually tapering to a point, and much like the fibre of flax; they are very strong and not easily removed by pulling or scraping; they retain moisture well. The roots are long, woody and tough, covered with a dark brown bark; on transverse section they present a central porous woody column, and several concentric rings of woody fibre, between which are situated portions of parenchyma. In the woody portions of the root there are large laticiferous vessels which contain a yellowish latex. The vascular system consists of very large dotted vessels. In the parenchyme are numerous conglomerate raphides.

SAKMUNIYA OR BAZAR SCAMMONY.—That sold in Bombay is all fictitious. It is said to be made in Surat, and does not in the least resemble any kind ef genuine Scammony. It occurs in irregular fragments of a bright green colour, somewhat translucent at the edges and having a resinous fracture; its odour and taste are suggestive of common resin. Rectified spirit dissolves the resin, and leaves a residue of green colouring matter and gum; the former is evidently of vegetable origin. It is difficult to ascertain what is the purgative principle of this mixture—possibly some resin derived from one of the Convolvulaceæ. Sometimes a black Sakmuniya is met with; this is also spurious, and is resinous in taste and smell, but has a more earthy appearance than the green variety. Rectified spirit dissolves out a quantity of resin, and leaves a black residue which, under the microscope, is seen to be made up of tufts of vegetable hairs, numerous small carbonaceous particles, and small irregular crystalline particles. Treated with dilute hydrochloric acid it effervesces feebly after a short time; with strong acid it effervesces strongly at once, and the vegetable matter is destroyed and forms a green solution. In Persia genuine Scammony is obtainable, but I have not been able to ascertain whether it is produced in that country or imported. The Arabs and Persians call it Mahmúdah. Mír Muhammad Husain in the Makhzan gives a good description of Scammony and the plant which produces it. He tells us that artificial Scammony is made from the juice of Calotropis gigantea, mixed with the flour of a kind of pulse called in Persian 'Karsanah.' His account of the uses of the drug does not differ materially from that given in European works, with the exception that Scammony when baked is said to lose its aperient properties and to act as a powerful diuretic. The baking process consists in enclosing the powdered drug in a bag, and then placing the bag inside an apple or quince which has been hollowed out for the purpose, the apple is then enclosed in dough like a dumpling and baked in an oven. The Mahometans attach much importance to the drug in consequence of its having been used by Hippocrates and other Greek physicians. (Conf. Hipp. Morb. mul. i., 59; Dios. iv., 165.)

Cuscuta Sp. ? Local name Kasús.

What is sold in the shops is a species of Cuscuta imported from Persia; it is mixed with the small oblong leaves and spines of the plant upon which it has grown; most of it is in seed, but the flowers are also present. The seeds are four in number, light-brown, convex on one side, concave on the other, enclosed in a round capsule. The taste of the drug is bitter; it is sometimes called Tukm-i-kasús.*

Cuscuta Sp. ? Local name, Aftímún.

This is also a dodder, but a rather larger plant than the last; the fruit and seeds are nearly double the size. The drug is imported from Persia, and has a bitter taste; in Arabic and Persian works it is described as the Aftímún† of the Greeks, which had so great a reputation as a remedy in melancholy madness; it is still a medicine of importance with the hakíms of India who follow in the footsteps of Jálenus (Galen).

Cuscuta reflexa, *Roxb., Cor. Pl. ii., t.* 104; *Hook Exot. Fl., t.* 150. Local name, Akásweli.

Another of the dodders, very common in some parts of India upon bushes; it bears small white bell-shaped flowers, and is used for the same purposes as Aftímún. In Western India it is particularly common in Guzerat upon the hedges of Euphorbia Tirucalli.

Cressa cretica, *Linn., Lam. Ill., t.* 183; *Sibth. Fl. Græc., t.* 256.

Vernacular.—Khardi.

This herb is used as a tonic, and is believed to possess expectorant properties. It is found in Greece and is supposed by some to have been one of the two kinds of ἀνθυλλίς described by Dioscorides.* It is a very small, shrubby, diffuse plant; leaves ovate-sessile, very small, acute, numerous, ashy or hoary-pubescent; flowers small, white or pink, subsessile, in the superior axils, forming a many-flowered head. It is common in cultivated fields in the cold weather.

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* كسوث or كشوث whence the Greek *κασσυθα* and Latin Cuscuta of the Middle Ages.

† *επιθύμον*, a parasitic plant growing on thyme. Dios. iv., 172; Pliny 26, 8.

BORAGINEÆ.

Cordia myxa, *Linn.*, *Delile Fl. Æg.*, *t.* 19, *f.* 1; *Wight Ill.*, *t.* 169.

,, **obliqua**, *Willd*, *Bedd. Fl. Syl.*, *t.* 245; *Wight Ic.*, *t.* 1378.

Vernacular.—Lasora (*Hind.*), Bahubara (*Beng.*), Bhokar, Sapistán (*Bomb.*), Naruvilli (*Tam.*)

History, Uses, &c.—The dried fruits of these trees are the Selu and Bahuvára of Sanskrit writers, the Sapistán of the Mahometans, and the Sebestens of old European works on Materia Medica. They are supposed by some to be the κοκκυμηλέα ἀιγύπτια of Theophrastus. Both trees are common in many parts of India. On the Western Coast, C. obliqua is abundant in Guzerat, where it is called Bargúnd, and C. myxa in the neighbourhood of Bombay. The natives pickle the fruit of both trees. Medicinally the dried fruit is valued on account of its mucilaginous nature and demulcent properties; it is much used in coughs and chest affections, also in irritation of the urinary passages: in larger quantities it is given in bilious affections as a laxative. Mahometan writers describe two kinds of Sapistán; the greater (C. obliqua), the pulp of which is separable from the stone, and the lesser (C. myxa), the pulp of which is adherent. The word Sapistán is an abbreviation of Sag-pistán, which means in Persian 'Dog's dugs.' In Arabic they are called Dibk and Mukhitah. Both trees are minutely described by Roxburgh. According to Horsfield the bark of C. myxa is used by the Javanese as a tonic.

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* Dios. iii., 144.

Description.—C. obliqua: Drupe oblate-spheroidal, about an inch or inch and a quarter in diameter, smooth, when ripe yellow; pulp in large quantity, soft, clear and very clammy, one-celled; nut nearly circular, laterally compressed, rugose on the outside, with a cavity at each end, the lower one deeper than the other, exceedingly hard, 4-celled, though rarely all fertile; seed solitary, ovate-oblong.

C. myxa: Drupe globular, smooth, the size of a cherry, sitting in the enlarged calyx, when ripe yellow; the pulp almost transparent, very tough, and viscid; nut cordate, at both ends bidentate and perforated, rugose, somewhat 4-sided, 4-celled, but it rarely happens that all prove fertile; seeds solitary. (Roxburgh.) Both kinds of fruit when dry are shrivelled, and of the colour of a dry prune. The pulp of C. obliqua can be separated from the nut, that of C. myxa cannot; on sawing through the nut a heavy disagreeable smell is observable.

Commerce.—The Sapistán of the Bombay shops is the fruit of C. obliqua. Value, Rs. 6½ per maund of 37½ lbs.

Echium Sp.—The herb and flowers.

Vernacular.—Gaozabán (*Hind.*, *Bomb.*, *Beng.* and *Tam.*) The flowers, Gul-i-gaozabán (*Hind.*, *Beng.*, *Bomb.* and *Tam.*)

History, Uses, &c.—A plant named βουγλωσσος is mentioned by Dioscorides, Paulus Ægineta, Pliny and other Greek and Latin writers as useful in the cold stage of fevers as a stimulant when added to wine. (Conf. Dios. iv., 123; Paulus Ægineta vi.; Plin 25, 8 and 26, 12.) Dioscorides says of it, ἔοικε δε φλόμω φυλλον χαμαιπετές τραχύ τε καὶ μελάντερον ὅμοιον βοός γλώσση—it has leaves like *Verbascum*, procumbent, but rough and blacker, like a bullock's tongue. Marcellus Virgilius, in his commentary upon Dioscorides, brings strong evidence in favour of the opinion that the Bugloss of the ancients was Borage, laying special stress upon the fact that Dioscorides, Paulus Ægineta, Galen and Pliny all mention its addition to wine to increase its stimulating effects, a well known use of the plant up to the present time.

Forskahl identifies the Lisán-el-thour of the Arabs with Borage. (Descr. Anim., p. 146; Flora LXII.) The author of the Makhzan, with other Persian writers, assumes that the Gaozabán of Persia is the same as the Bugloss of the Greeks and Romans, and gives Sankáhul as an Indian synonym; he then unmistakably describes the leaves, flowers and fruit of the Gaozabán we now receive from Persia, and says that most of the drug comes from Gilán. He also mentions another kind with smaller leaves as coming from Azimábád in India. Mír Muhammad Mumin, in his Tuhfat-el-múminin, says that in Ispahán and some other towns of Persia a kind of Gaozabán is called Marmakhúz, and has a small round blue flower.

Description.—The following description is drawn up from an examination of orignal bales of the plant and flowers imported from Persia:—Gaozabán is a large herbaceous, perennial plant with black woody rhizomes, 1 to 2 inches in diameter, and terminating in a knotty head, from which spring several angular stems, thickly studded with calcareous tubercles, and armed with stiff, white, calcareous bristles. The leaves, which, are very fleshy, entire, petioled, and of an ovate acuminate shape, have a slightly waved margin; the largest seen were 8 inches long by $4\frac{1}{2}$ inches broad, the cauline leaves were $4\frac{1}{2}$ by 2 inches, gradually decreasing to 1 inch; both sides of the leaves are thickly studded with calcareous tubercles which support stiff white calcareous bristles. Heads of flowers scorpioid and branched, thickly studded with white stiff bristles; bracts lanceolate to linear lanceolate, bristly; calyx half an inch long, 5-partite; segments linear-lanceolate, bristly; peduncles very short when the plant is in flower, lengthening to half an inch when in seed, and becoming studded with calcareous spots; pistil hairy, bifid at the apex, double the length of the calyx; corolla one and a half inch long, half an inch wide at the throat, funnel-shaped, almost bilabiate, externally hairy, 5-lobed, two upper lobes longest, throat of corolla glabrous, naked; stamens five, attached, a few long, weak hairs between the stamens; fruit consists of oblong rugose nuts, $\frac{1}{4}$th to $\frac{6}{10}$ths of an inch long, supported upon bony cups one-twelfth of an inch in diameter. If long kept the flowers lose their deep blue colour and turn reddish. In India the drug has long held a high place in native practice as an alterative tonic in syphilitic, leprous, and rheumatic cases; it has also diuretic and demulcent properties. O'Shaughnessy (Beng. Disp., p. 420,) notices it favourably, but there is some doubt as to the kind of Gaozabán used by him. Mr. M. Sheriff and others have suggested its use as an alterative instead of Sarsaparilla. It may be given in decoction (1 oz. to a pint of water) in doses of from 2 to 4 ounces three or four times a day. Whatever its alterative powers may be, there can be no doubt as to its mucilaginous properties and strong saline taste.

Chemical composition.—In boraginaceous plants there occurs a nitrogenous substance differing from gluten, the solution of which in boiling water solidifies on cooling to an imperfect jelly, and is precipitated by acids. It is also precipitated by the alkaline earths and by most salts, but tannin merely clouds it. (Braconnot, J. Phys. 84, 274.) In Gaozabán this nitrogenous substance is particularly abundant.

The ash of the leaves and stalks of Gaozabán has been examined by Deshmukh (1884), with the following results:—Silica, 24·17; Carbonic acid, 15·71; Alumina with traces of iron, 1·87; Lime, 27·31; Magnesia, 2·77; Potash, 14·56; Soda, 9·51; Sulphuric acid, 1·79; Phosphoric acid, 1·06; Chlorine, 1·47.

Commerce.—Value, Goazabán, Rs. 7 per maund of 37½ lbs.; Gul-i-gaozabán, Rs. 12 per maund.

Rang-i-badshah. Alkanet.

This drug was well known to the Greeks and Romans as ἄγχουσα and Anchusa. It is mentioned by Theophrastus (vii., 8) Dioscorides (iv., 35, 36), and Pliny (22, 20). Dioscorides describes three kinds; it was used as a dye, and medicinally as an astringent. Ibn Sina calls it انجوسا Anjusa; he gives Kas-el-himár as the Arabic name, and quotes Galen with regard to its medicinal properties; he also mentions several other names for the different kinds of Alkanet, amongst others Bú-kalía. The author of the Makhzan, in his article upon Abú-kalsa, gives a long list of names for the four kinds of Alkanet described by Mahometan writers; he states that Harjúya is the Persian, and Ratanjot the Indian name for them. In Bombay Alkanet is best known as Rang-i-bádshah (King's dye) or Ratanjot, and is chiefly used for colouring medicinal oils, &c. In Southern Europe Alkanna tinctoria, *Tausch.*, *Syn.*—Anchusa tinctoria, *Linn.*, the Orcanette of the French, is the chief source of the drug. In India Onosma Hookeri and in Central Asia Arnebia sp.? supply Alkanet; that which is sold in the Bombay bazar usually comes from China; it is the root of Anchusa tinctoria, *Linn.*, and is long, woody, twisted, and of a dull red colour. Alkanet imparts a rich red colour to spirit, ether, oils and fats, which is insoluble in water; with alkalies it gives fine blue colours. The colouring principle has been named Anchusin or Anchusic acid; it is amorphous, of a deep red colour, and resinous fracture. (Conf. Gmelin's Handbook, XVII., 17.)

The word Alkanet is derived from the Arabic الحنا Al-Hanna, and was formerly applied to Lawsonia alba, *Lam.*, the Henna plant, so well known in the East as a red dye.

Heliotropium indicum, *Linn.*, *Wight Ill.*, *t.* 171. The herb.

Syn.—Tiaridium indicum.

Vernacular.—Hathi-shura (*Hind.* and *Beng.*), Búrúndi, (*Bomb.*), Tel-kodduki (*Tam.*)

History, Uses, &c.—This plant appears to be very generally used as a vulnerary in different parts of the world. Ainslie describes it under the name of Heliotropium indicum, or Indian Turnsole, and gives Sri-hastini and Bhúrúndi as the Sanskrit names. Of its medicinal properties he says:—"The juice of the leaves of this plant, which is a little bitter, the native practitioners apply to painful gum boils, and to repel pimples on the face; it is also prescribed as an external application to that species of ophthalmia in which the tarsus is inflamed or excoriated. The Heliotropium indicum is also a native of Cochin-China and of the West Indies; in the first mentioned country the natives call it Cay-boi-boi." Of its virtues, Loureiro says:—"Folia istius herbæ contusa maximé conducunt ad majores anthaces, vel, quando incipiunt, resolvendos, vel postea suppurandos." (Flor. Coch.-Chin., Vol. I., p. 103.) It is well described by Browne, in his History of Jamaica (p. 150), and I find Barham (p. 42) tells us that it cleans and consolidates wounds and ulcers, and that boiled with castor oil it relieves the pain from the sting of a scorpion, and cures the bite of a mad dog! (Mat. Indica, Vol. II., p. 414.)

In Bombay the plant is used as a local application to boils, sores, and the stings of insects and reptiles.

Description.—An annual plant common in ditches where the soil is rich. The whole plant is more or less covered with simple hairs, stems several, as thick as the little finger, hollow, branched from the axils of the leaves; leaves generally alternate, cordate-ovate, rugose, long-petioled; petioles margined; spikes terminal, solitary, simple; flowers like those of the garden Heliotrope, but smaller; fruit mitre-shaped. The plant has a fetid odour like Stramonium; taste a little bitter.

Heliotropium europæum, *Linn., Jacq. Aust.* 3, *t.* 207.

Vernacular.—Poput búti. One of the few European plants found in Sind. It is the *ἡλιοτρόπιον τὸ μέγα* of the Greeks and the Herba solaris of the Latins; it has purgative and emetic properties, and was used by the ancients to expel bile and phlegm, and locally applied to scorpion bites. The leaves, boiled in castor oil, are said by Murray to be used in Sind to relieve the pain of scorpion stings, and also for cleansing and healing ulcers.* H. brevifolium and H. undulatum are used for similar purposes in Northern India.

Ehretia buxifolia, *Roxb. Cor. Pl. i., t.* 57. The root.

Vernacular—Pálá (*Hind.* and *Bomb.*), Kúruvingi (*Tam.*) Ainslie tells us that the root when fresh is sweet and slightly pungent, and is used as an alterative in cachexia and syphilis. The Mahometans consider it to be an antidote to vegetable poisons.

Description.—A shrub ; leaves alternate, fascicled, sessile, reflexed, cuneiform, very scabrous, shining; peduncles axiliary, 2—6 flowered, pedicels very short; flowers small, white ; calyx 5-parted, segments lanceolate; corolla campanulate, 5—6 cleft; berry succulent, red, quadrilocular; nuts two. Flowers in July or August, Deccan.

Ehretia obtusifolia, *Hochst.*

A native of Sind and the Punjab ; a decoction of the fresh root is used in venereal diseases.

Coldenia procumbens, *Linn.*, *Lam. Ill., t.* 89 ; *Gärtn. Fruct. i., t.* 68. Tripakshí (*Bomb.*) The plant, called Tripakshí in Sanskrit, and Tripunkhí in Hindí, when dried and powdered and mixed with an equal portion of powdered fenugreek seeds, is made into a paste and applied to boils to promote maturation. C. procumbens is a common weed in rice fields during the cold weather ; it is herbaceous, with procumbent hirsute stems ; leaves shortly petioled, obovate, plicate, coarsely-toothed, with adpressed hairs above, hirsute beneath; flowers axillary, solitary, sessile, white; nuts rugose, rough. (*Bombay Flora*, p. 171.)

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* Conf. Dioscorides iv., 185; Theophr. H. P. vii., 3.

SCROFULARIACEÆ.

Picrorrhiza Kurroa, *Royle, Ill.* 291, *t.* 71. The roots.

Vernacular.—Kutkí, Kurû (*Hind.* and *Beng.*), Kálí-kutki, Bálkaḍu (*Bomb.*), Katuku-rogani (*Tam.*), Kaur (*Punj.*)

History, Uses, &c.—The root of P. Kurroa is described in Sanskrit works under names of Katuka and Katurohini as a bitter stomachic and mild aperient. It is directed to be used in fever and dyspepsia, and as an ingredient in certain purgative mixtures. Chakradatta says that about two drachms of the powdered root given with sugar and warm water act as a gentle aperient. Mahometan writers give Kutki as an Indian synonym for black Hellebore, but unmistakably describe the latter plant and its medicinal properties. This mistake has misled most European writers upon Indian drugs, but Ainslie, though he describes the drug under his article upon black Hellebore (Mat. Ind. I., p. 164), has the following remarks:—"I have given the names Kadagoroganie and Kali-kootkie as the Tamool and Dukhanie appellations of the black Hellebore, as the root procured in the Indian bazars, is commonly said to be so; but I have great doubts of it, and I here offer a caution respecting it, as it by no means agrees in appearance with the black Hellebore of the European shops, though it is equally nauseous, bitter, and acrid." Although there is still some doubt about the matter, the Kutki of the bazars is generally considered to be the root of P. kurroa, a plant of Kumaon and other parts of Northern India. According to Royle (Illust. Vol. I., p. 291), its root possesses much bitterness, and is employed medicinally by the natives. Irvine (Mat. Med., Patna, p. 58,) assigns Kutki as its Hindustani name, and mentions its use as a tonic. Mr. M. Sheriff has found in bales of the commercial

Kutki, plants (without flowers) which agree with the description of P. kurroa. In the Calcutta Exhibition Catalogue it is stated that the roots of Gentiana Kurroo form part of the Kurú or Kutki of the Bazars, but I have been unable to find any admixture of roots in the bazar Kurú, or in a sample of Kurú obtained from Mussooree; the drug, whatever its botanical source may be, is evidently the root of a single species. As regards the medicinal properties of the drug, the accounts given by Sanskrit writers appear to be correct. Mr. M. Sheriff speaks favourably of it as a powerful bitter tonic and antiperiodic. Other medical men in India have expressed a similar opinion, and I can state from personal observation that it is used successfully as an antiperiodic in native practice in Bombay; its slight laxative action is rather beneficial than otherwise. The dose as a tonic is from 10 to 20 grains, as an antiperiodic from 40 to 50 grains; it is best administered in combination with aromatics.

Description.—The drug consists of a rhizome, generally about the size of a goose-quill, but often no larger than a crow-quill, the lower portion of which is covered by a shrivelled, greyish-brown, corky bark, and marked by prominent scars, the remains of rootlets; towards the upper end it becomes larger (¼ inch in diameter), and is thickly set with dark greyish-brown scales, and terminates in a scaly leaf-bud or stem. The rhizome is generally broken into short pieces, from 1 to 2 inches long; the fracture is short, the root very fragile and light, and black internally; it has no odour, and a very bitter taste.

Microscopic structure.—The corky bark is made up of numerous rows of empty brick-shaped cells; within this is a cellular parenchyma of oblong brown cells, containing a little granular matter; next a dark brown line composed of wood cells, forming the boundary of the inner column of the root; within this several very large bundles of dotted vessels arranged so as to form a broken ring, which surrounds a central cellular parenchyma.

Commerce.—Value, Rs. 9 per maund of 37½ lbs. Kumaon annually exports about five tons of this drug.

Herpestis Monniera, *H. B. et K., Bot. Mag., t.* 2557; *Roxb. Cor. Pl. ii., t.* 178; *Rheede Hort. Mal. x., t.* 14. The herb.

Vernacular.—Brahmí (*Hind.* and *Beng.*), Nir-brami (*Tam.*), Báma (*Bomb.*)

History, Uses, &c.—Dutt informs us that this plant is the Brahmí of the native physicians of Calcutta, where it is considered to be a nervine tonic useful in insanity, epilepsy, &c. Whether he is correct in taking it to be the Brahmí of Sanskrit writers is, I think, doubtful. In Bombay Hydrocotyle asiatica is known by this name. Ainslie says that in Southern India the Gratiola monniera is considered diuretic and aperient, and useful in that sort of stoppage of urine which is accompanied with obstinate costiveness. Roxburgh mentions the use of the juice mixed with petroleum as an external remedy in rheumatism. These accounts hardly agree with the properties ascribed to Brahmí by Sanskrit writers. H. Monniera is a very common plant in moist places, such as the borders of tanks, &c., in the neighbourhood of Bombay, but I have not seen it made use of medicinally.

Description.—Stems several, annual, creeping, round, jointed, smooth, succulent; leaves opposite, sessile, obovate, wedge-shaped, or oblong, smooth, entire, obtuse, fleshy, dotted with minute spots; peduncles axillary, alternate, solitary, round, smooth, shorter than the leaves, one-flowered; flowers blue; bracts two-awled, pressing on the calyx laterally; calyx 5-leaved, the exterior three leaflets large, oblong, the two interior small, linear, all are concave, smooth, pointed and permanent, corol campanulate, border 5-partite, nearly equal; anthers two-cleft at the base, blue; stigma large, somewhat 2-lobed; capsule ovate, two-celled, two-valved; seeds very numerous. (Roxb., Flora Ind., I., p. 141.)

Celsia coromandeliana, *Vahl., Wight Ic.,* 1406. Under its Bengali name Kukshima has been brought to notice as a sedative and astringent in dysentery. (Confer. Phar. of India, p. 161.) It has a Sanskrit name, Kuláhala, and is known to the Hindus as having medicinal properties. The plant is herbaceous, pubescent and viscid ; lower leaves lyrate, floral cordate, stem clasping ; peduncles longer than the calyx ; calycine segments ovate, slightly toothed, or oblong-lanceolate, entire ; flowers largish, yellow ; filaments bearded with purple hairs.

Habitat.—Beds of rivers and waste places in the Deccan.

I know nothing of its medicinal use in this part of India. The Marathi name is Kutkí.

Schweinfurthia sphærocarpa, *A. Braun., Wight Ic.,* 1459.

Syn.—Antirrhinum glaucum.

Vernacular.—Sanipát.

The drug consists of the plant in fruit, broken up into small pieces. The fruit is a globular dry papery mucronate capsule, firmly attached to the calyx ; the upper part of the capsule to which the placenta is attached is double ; the placenta, which is large and oblong, is supported upon a thick peduncle, and occupies the centre of the capsule ; to it are attached numerous straight five-angled wedge-shaped seeds, which are packed closely together and fill the remaining space. The calyx is 5-partite, the upper segment very large and extending over the fruit like a hood. Leaves ovate, leathery, about 1 inch long with short blunt hairs ; margin much lighter in colour than the rest of the leaf ; seed straight, wedge-shaped, with six prominent longitudinal ridges ; testa tubercular, each tubercle minutely granular. The portions of stem, which are numerous, are woody and covered by a thin grey bark ; the central pith is very large. The drug has a slightly bitter somewhat tea-like taste, and is prescribed in the condition known in Sanskrit as Sanipát (typhoid symptoms). It is said to come from Northern India.

Torenia asiatica, *Linn.*, *Rheede Hort. Mal. ix.*, *t.* 53. The herb.

Rheede says that the juice of the leaves is considered on the Malabar Coast to be a cure for gonorrhœa. The plant is there called Kákápu ; it is pretty common in the Concans, but appears to have no reputation as a medicine.

Sopuba delphinifolia, *G. Don*, *Roxb. Cor. Pl.* 1, *t.* 90; *Pluk.* 17, *t.* 358, *f.* 3.

Vernacular.—Dudháli (*Bomb.*)

An elegant annual, common in wet fields in the rainy season. The juice is applied by field labourers to their feet to heal sores caused by exposure to wet, it is astringent and stains the skin yellow at first but afterwards black. The plant was formerly named Gerardia, after John Gerarde, our old English botanist, and author of the " Herbal," published in 1597.

Lindenbergia urticæfolia, *Lehm. in Link et Otto Abbild.* 95, *t.* 48; *Hook. Ic. Pl.*, *t.* 875. A common plant throughout India upon walls and banks, the juice is given in chronic bronchitis, and mixed with that of the Coriander is applied to skin eruptions. The plant has a faint aromatic odour and a slightly bitter taste. The Marathi name in the neighbourhood of Bombay is *Dhol.* Roxburgh, under the name of *Stemodia ruderalis*, gives the following description of it:—" *Root* ramous, seems perennial. *Stems* many, ascending, ramous, herbaceous, woody, somewhat viscous, the whole plant about 12 or 18 inches high. *Leaves* opposite, petioled, ovate, deeply serrate, soft, a little hairy ; about an inch long. *Petioles* shorter than the leaves, channelled. *Stipules* none. *Flowers* axillary, subsessile, solitary, opposite, small, yellow. *Calyx* ten-furrowed, 5-toothed, permanent. *Corol* personate ; *tube* the length of the calyx; both lips projecting, and shut; apex of the under lip broad, depending, 3-toothed, of the upper one very narrow, bifid; inside of both hairy, and beautifully marked with small purple dots. *Filaments* and *anthers* as in the genus. *Stigma* slightly two-lobed." (Flora Indica, III., 94.)

ACANTHACEÆ.

Andrographis paniculata, *Nees, Bentl. and Trim., t.* 197. The plant.

Vernacular.—Kiryat (*Hind.*), Olikiryat (*Bomb.*), Kálmeg (*Beng.*), Shirat-kuch-chi, Nila-vembu (*Tam.*)

History, Uses, &c.—Concerning this plant, Dutt (Hindu Mat. Med., p. 216,) informs us that there is some doubt regarding its Sanskrit name. He says:—" A plant called Yavatiktá, with synonyms of Mahátikta, Sankhini, &c., is said by some to mean this herb, but the term Mahátikta, when occurring in Sanskrit prescriptions, is usually interpreted as Melia sempervirens, Sw.,* and Yavatiktá has not been noted by me as having occurred in any prescription, so that I am inclined to think Andrographis paniculata was not used in Sanskrit medicine. The plant is well known in Bengal under the name of Kálmeg, and is the principal ingredient of a domestic medicine for infants, called Alui, which is made of the expressed juice with the addition of cardamoms, cloves, cinnamon, &c., and is given to infants for the relief of griping, irregularity of the bowels, and loss of appetite."

Both Hindu and Mahometan medical writers would appear to have confounded this drug with chiretta. According to Forskahl, it is common in Arabia, and is there called Wizr. (Forsk. Flor. Aeg. Ar. CII.) Ainslie speaks of the plant as having been brought to the southern parts of the Indian peninsula, from the Isle of France, but in Western India it is certainly a native. Flückiger and Hanbury in their Pharmacographia point out that it has been wrongly supposed to be a constituent of the famous bitter tincture called by the Portuguese of India *Droga amara*. In the Pharmacopœia of India it has been made official, and directions for making a compound infusion and compound tincture are given. In Bombay the herb is very common in shady situations, and is much used by the natives as a domestic remedy for fever in combination with aromatics, especially with lemon grass. In the Concan Kirayat, Ginger and Dikamali are given in fever, and the fresh juice with black pepper, rock salt and Asafœtida in colic. In the chronic febrile condition known as Barik-táp, Kirayat, Ginger, Picrorrhiza root, wild dates, and Conessi bark are infused and given with honey every morning. A. echioides, *Nees*, is said to have similar medicinal properties.

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* M. Azedarach, *Linn.*

Description—Annual, 1 to 3 feet; stem quadrangular, pointed, smooth; leaves opposite, on short petioles, lanceolate, entire, upper surface dark-green and shining, under-surface paler and finely granular, they vary much in size, but the larger are usually about 3 inches in length and one inch in breadth; calyx deeply 5-cleft; corolla bilabiate; lips linear, reflected, upper one 3-toothed, lower one 2-toothed; flowers remote, alternate, on long petioles, downy, rose-coloured, or white streaked with purple; capsules erect, somewhat cylindrical; seeds 3 to 4 in each; root fusiform, simple, woody, with numerous fine radicles.

Chemical composition.—According to the authors of the Pharmacographia :—"The aqueous infusion of the herb exhibits a slight acid reaction, and has an intensely bitter taste, which appears due to an indifferent, non-basic principle, for the usual reagents do not indicate the presence of an alkaloid. Tannic acid, on the other hand, produces an abundant precipitate, a compound of itself with the bitter principle. The infusion is but little altered by the salts of iron; it contains a considerable quantity of chloride of sodium."

Commerce.—A. paniculata is not an article of commerce in Bombay, but the fresh plant is sold by the herbalists and gardeners.

Adhatoda Vasica *Nees, Bot. Mag., t.* 861; *Pluk. Alm., t.* 173. The leaves, root, and flowers.

Vernacular.—Arusa (*Hind.*), Adulsa (*Bomb.*), Bákas (*Beng.*), Adatodai (*Tam*).

History, Uses, &c.—This shrub has considerable reputation all over India as an expectorant and antispasmodic, and is largely prescribed in consumption and other chest affections, attended with cough and hectic fever. Sanskrit writers call it Vasaka or Atarusha, and direct the fresh juice of the leaves to be given in doses of one tolá (180 grs.), with the addition of honey and long pepper, in cough. Dutt, in his Hindu Materia Medica, gives several compound preparations of the drug extracted from Sarangadhara and the Bhavaprakasa, and remarks that there is a saying that no man suffering from phthisis need despair as long as the Vasaka plant exists. Persian writers upon Indian Materia Medica notice the plant under its Hindustani name of Arusa. The author of the Makhzan-el-Adwiya describes it correctly, and says that the wood is used to make toothpicks and gunpowder. Medicinally the flowers are useful in hectic, heat of blood, and gonorrhœa, the root in cough, asthma, febrile disturbances and gonorrhœa; the fruit is sometimes hung round the necks of children to keep them from catching cold. Ainslie informs us that :—" In Ceylon, the Malabar nut tree is said to grow to the height of fourteen or fifteen feet, and is there called Wanapala. The flowers, leaves and root, but especially the first, are supposed to possess antispasmodic qualities; and are prescribed in certain cases of asthma, and to prevent the return of rigor in intermittent fever; they are bitterish and subaromatic, and are administered in infusion and electuary. In the last mentioned form the flowers are given to the quantity of about a teaspoonful twice daily." (Mat. Ind. II., p. 3.) Roxburgh remarks that the wood is well fitted for making charcoal for gunpowder. Strong testimony in favour of the remedial properties of the drug was furnished to the authors of the Pharmacopœia of India by Drs. Jackson and Dutt, who employed it with marked success in chronic bronchitis, asthma, and other pulmonary and catarrhal affections. Cases illustrative of its effects in catarrh, bronchitis and phthisis have been published by Mr. O. C. Dutt. (Indian Annals of Med. Sci., 1865, Vol. X., p. 156.) In Bengal the leaves are smoked in asthma; good evidence of their value when thus used has been collected by Dr. Watt in his Dict. of the Economic Products of India.

In Bombay its expectorant properties are well known; it is often prescribed by the natives in combination with borax and honey, or with aromatics, such as ginger, &c. In the Concan, Justicia picta, a well known garden shrub, is used medicinally in the same manner as Adulsa. The variegated variety is called Pándhara adulsa, and the dark-leaved kind Kála adulsa.

Description.—A small tree or large shrub, flowering in the cold season; trunk straight; bark pretty smooth, ash-coloured; branches sub-erect, with bark like that of the trunk, but smoother; leaves opposite, short, petioled, broad, lanceolar, long, taper-pointed, smooth on both sides, about 5 to 6 inches long and 1½ broad; spikes from the exterior axils, solitary, long-peduncled, the whole end of the branchlet forming a leafy panicle, flower-bearing portion short, and covered with large bracts; flowers opposite, large, white, with small ferruginous dots, the lower part of both lips streaked with purple; bracts 3-fold, opposite, one-flowered, exterior one of the three, large, ovate, obscurely, 5-nerved, interior pair much smaller, end sub-lanceolate, all are permanent; calyx 5-parted to the base, divisions nearly equal; corolla ringent, tube short, throat ample, upper lip vaulted, emarginate, lower lip broad and deeply 3-parted, both streaked with purple; filaments long, resting under the vault of the upper lip; anthers twin. (*Roxb.*)

Commerce.—The dried flowering branches are sold in the Bombay shops. Value, Rs. 3½ per maund of 37½ lbs.

Hygrophila spinosa, *T. And., Wight Ic., t.* 449; *Rheede Hort. Mal. ii., t.* 45. The plant and seeds.

Vernacular.—Tálmakhárá (*Hind.*), Tálimkháná, Kolsunda (*Bomb.*), Nirmulli (*Tam.*), Kuliákhárá (*Beng.*)

History, Uses, &c.—Under the names Kokilaksha and Ikshugandhá, this common plant is described as cooling and diuretic by Sanskrit writers; the root alone and the ashes of the plant are also considered to have similar properties. The drug is prescribed in hepatic obstruction with dropsy, rheumatism and urinary affections. Mahometan writers mention the use of the plant for the same purposes, and also its external application in rheumatism, but they notice more especially the use of the seeds as an aphrodisiac given either with sugar, milk or wine in doses of from one to three dirhems. Ainslie, speaking of this plant, says:—"This root, which has got its Tamool name from growing near water, is supposed to have virtues similar to those of the Moollie-vayr (Solanum Indicum, *Linn.*,) already mentioned. The plant is the Bahel-schulli of Rheede, who tells us that on the Malabar Coast a decoction of the root is considered as diuretic, and given in dropsical cases and gravelish affections; the dose is about half a teacupful twice daily. The species in question is a native of the Western Coast of India, whence the root is brought across the peninsula to the medicine bazars of the Carnatic. Our article is called Katu-iriki by the Cingalese." (Mat. Ind. II. p. 236.) In the Pharmacopœia of India several European contributors bear testimony to the diuretic properties of the plant, but no mention is made of the use of the seeds as an aphrodisiac and diuretic. In Bombay they are very generally used, and are to be found in every druggist's shop. The statement in the Bombay Flora that it is a religious service among the Hindus to collect a lac (1,00,000) of the flowers and present them to their idols is not strictly correct, as not these flowers only, but others, are used in the same way.

Description.—Roots often biennial, tapering, with numerous rootlets; stems herbaceous, ascending or erect, ramous, jointed, a little flattened, hairy, from 2 to 3 feet high; branches opposite, like the stem, and also nearly erect; leaves an exterior, opposite, sessile pair at each joint, within these and subalternate with the spines, several small ones in a verticel, all are linear-lanceolate, margins often revolute, hairy, almost bristly, size various; spines 6 in each virticel, between the leaves and flowers, awl-shaped, spreading and a little recurved; flowers verticelled, numerous, sessile, large, of a bright blue; bracts lanceolate, margins and outside bristly; calyx of two pairs of nearly equal leaflets, clothed with soft hair; corol two-lipped, lips nearly equal, upper 2-parted, with the division emarginate, the under one 3-parted, with the division also emarginate, in the under a coloured body like a large oblong anther; filaments connected at the base, second pair larger than usual in the genus; anthers sagittate; stigma subulate, involute, with a fissure on the upper side. (*Roxb.*) The seeds are small and flattish, of irregular form and brown colour, the largest $\frac{1}{10}$th of an inch long and $\frac{1}{16}$th broad. When placed in the mouth they immediately become coated with a large quantity of extremely tenacious mucilage, which adheres to the tongue and palate, and is of rather agreeable flavour.

Microscopic structure.—When a section of the seed is placed under the microscope with a drop of water the development of the mucus may be observed. It appears to spring in filaments from the columnar cells of the testa; these spread rapidly in every direction, and form a network which resembles the growth of some of the lower forms of algæ; it does not dissolve when much water is added.

Commerce.—The seeds alone are an article of commerce in Bombay. Value, Rs. 6 per maund of 37½ lbs. The plant is common in rice fields, but appears to be little used in this part of India.

Dædalacanthus roseus, *T. And.*

Syn.—Eranthemum roseum.

Vernacular.—Dasmúlí (*Mar.*)

Roots tuberous, spindle-shaped, usually ten in number, as thick as a quill, several inches in length and covered by a dark brown bark; leaves elliptic, glabrous, scabrous on the veins beneath; spikes axillary-peduncled, imbricated; bracts oval, somewhat wedge-shaped, acute, ciliated, with long hairs, reticulately veined; tube of corolla very long and slender; flowers deep blue, turning bright red as they fade. The root boiled in milk is a popular remedy for leucorrhœa; dose one drachm. In the Southern Concan it is given to pregnant cattle to promote the growth of the fœtus.

Rhinacanthus communis, *Nees, Rheede Hort. Mal. ix., t.* 69; *Bot. Mag., t.* 325. The leaves and root.

Vernacular.—Pálak-juhi, Jui-pani (*Hind.* and *Beng.*), Gachkaran (*Bomb.*), Naga-malli (*Tam.*)

History, Uses, &c.—Indian works on Materia Medica give various prescriptions for the use of the juice of the leaves and the bark of the root of this plant as a remedy for the affection of the skin known to Europeans in India as Dhobie's itch, Malabar itch, &c. (Tinea circinata tropica). Whichever part of the plant may be used, it is directed to be made into a paste with limejuice or with aromatics, and applied for several successive days to the affected part. Native testimony in favour of its efficacy is very strong. (Confer. Makhzan-el-Adwiya, article "Palak-Juhi.") Ainslie, speaking of the Justicia nasuta, *Linn.*, says:—"This root fresh, when bruised and mixed with limejuice, is considered as a sovereign application for ringworms and other cutaneous affections; the leaves are also employed for the same purposes. The plant is the pulcolli also peelcolli of the Hort. Mal. (IX., p. 135, t. 69). I have taken the liberty of giving it the English name of Nagamullie, by which it is universally known in Lower India." (Mat. Ind. II., p. 216.) Roxburgh in his Flora Indica (I., p. 121,) informs us that besides its use as a remedy for ringworm, milk boiled on the roots, is reckoned by the Indian physicians aphrodisiacal; the roots, he also says, are used for the bite of poisonous snakes, hence the Telinga and Tamul name Naga-mulli, or Jasmine of the Cobra-di-capello. I have not been able to find that the roots are used for the purposes mentioned by Roxburgh, in Western India, but they as well as the leaves are well known remedies for ringworm. The same is the case in Goa, where the local name of the plant is Dovi-usht. R. communis is very common in gardens in Bombay, and grows wild upon the Western Ghauts. Roxburgh gives Yúthika-parni as the Sanskrit name. Latterly, under the name of Tong-pang-chong, Rhinacanthus has found considerable favour in Europe as a remedy for chronic eczema and some other skin affections of a similar character. An extract of the plant appears to be the best preparation.

Description.—A thin shrub, about 5 feet in height. Root woody, ramous; stems many, erect, ramous, the old woody parts round, and covered with pretty smooth, ash-coloured bark, the tender branches and young shoots jointed, smooth, and obscurely six-sided; leaves opposite, petioled, broad-lanceolate, point obtuse, above smooth, below a little downy, entire, from 2 to 4 inches long and from 1 to 2 broad; panicles corymbiform, axillary, and terminal, always 3-cleft, as also the subdivisions; peduncles and pedicels short, round, a little downy; bracts minute; flowers small, white; corol with a long, slender compressed tube, under lip broad, 3-cleft, upper lip erect, linear sides reflected, apex bifid; nectary, a fleshy ring surrounding the base of the germ; anthers without the tube, twin. (*Roxb.*) The leaves when chewed have a pungent taste something like cassia bark; their odour when crushed is disagreeable,

Chemical composition.—Liborius has analysed the root in the Dorpat Laboratory, finding in it 13·51 per cent. of ash and 1·87 per cent. of rhinacanthin, besides the ordinary constituents of plants.

Rhinacanthin is a dull cherry-red resinous substance, which contains no nitrogen, and does not reduce copper solution. It seems to be related to chrysophanic and frangulic acids. Two ultimate analyses gave a mean of carbon 67·55 per cent., hydrogen 7·36 per cent. The formula $C^{14} H^{18} O^{4}$ corresponds with 67·20 C and 7·20 H.

Barleria Prionitis, *Linn.*, *Rheede Hort Mal. ix.*, *t.* 41; *Pluk. Alm.*, *t.* 119, *f.* 5; Karuntaka (*Sans.*), Katsareyá (*Hind.*), Kántajáti (*Beng.*), Kalsunda, Vajradanti (*Bomb.*), Shemmuli, Varamulli (*Tam.*), is a very common plant near the sea-shore in Bombay and the neighbourhood. The natives apply the juice of the leaves to their feet in the rainy season to harden them, and thus prevent the maceration and cracking of the sole which would otherwise occur. Ainslie says that the juice of the leaves, which is slightly bitter and acid, is a favourite medicine of the Hindus of Lower India, in those catarrhal affections of children which are accompanied with fever and much phlegm; it is generally administered in a little honey or sugar and water in the quantity of two tablespoonfuls twice daily. (Materia Indica II., p. 376.) B. Prionitis is the Coletta-veetla of Rheede (Hort. Mal. IX., p. 77, t. 41,) and the Hystrix frutex of Rumphius (Amb. VII., t. 13). In the Concan the dried bark is given in whooping cough, and 2 tolás of the juice of the fresh bark with milk in anasarca. Dr. Bidie observes that it acts as a diaphoretic and expectorant.

Description.—Stem short, erect; branches numerous, opposite, erect, round, smooth; the whole plant 2 to 3 feet high, thorns axillary, generally about four, straight, slender, sharp; leaves opposite, decussate, short petioled, oblong, waved, a little mucronate, smooth; flowers axillary, generally solitary sessile, large, yellow; bracts uncertain; when there are no thorns on the same axil, there are two, opposite, linear, daggered, besides an undetermined number of very small ones; stamens, the long pair projecting, their filaments compressed; stigma entire, cylindric, open, pitted; capsule conical, 2-seeded, one seed in each cell. (*Roxb.*)

Acanthus ilicifolius, *Linn.*, *Rheede Hort. Mal. ii.*, *t.* 48; *Syn.*—Dilivaria ilicifolia; *Vern.*—Harikassa (*Sans.*), Harkuchkánta (*Hind.* and *Beng.*), Márándi (*Mar.*), Moranna (*Goa.*), is a shrub common in salt marshes, which may be immediately recognised by its elliptic-sinuate, dentate-spinous, waved leaves and great resemblance to our common holly. It has handsome blue flowers. In Goa the leaves which abound in mucilage are used as an emollient fomentation in rheumatism and neuralgia. Ainslie calls the plant Holly-leaved Acanthus, and says that Rheede mentions the use of the tender shoots and leaves ground small and soaked in water as an application to snake-bites. Bontius commends its expectorant qualities. It is a plant in great request among the Siamese and Cochin-Chinese, and is called by the latter Cay-o-ro, who consider it to be cordial and attenuant, and useful in paralysis and asthma. (Flora Cochin Chin., Vol. II., p. 375.) In the Concan a decoction of the plant with sugar-candy and cummin is given in dyspepsia with acid eructations.

Justicia procumbens, *Linn.*; *Syn.*—Rostellularia procumbens; *Vern.*—Gháti-pitpáprá (*Bomb.*), is a small plant, very abundant in the rainy season. The whole herb is gathered when in flower and dried. It has a faintly bitter disagreeable taste, and is used as a substitute for Fumaria, the true Pit-páprá.

Description.—Stem procumbent, diffuse; leaves lanceolate-elliptic or rounded, glabrous or sparingly hairy; spikes compressed, slender; calycine segments lanceolate, membranous on the margin, minutely ciliated; bracts of the same shape and shorter than the calyx; flowers small, pale purple; root slender, long, woody, straight, with numerous slender stems spreading from the crown.

Strobilanthes ciliatus, *Nees, Wall. Pl. As. Rar. iii.*, 85; *Bedd. Ic. Pl. Ind. Or.*, *t.* 211.

Vernacular.—Kárvi, Kara (*Bomb.*)

A very common, erect, branchless shrub, with stems as thick as a walking stick and quite straight, much used like the bamboo, in the construction of mud walls and fences ; it flowers in October in closely imbricated cone-like spikes, bearing bright blue flowers. The plant has a strong aromatic odour, and is used as a rustic medicine. The bark with an equal quantity of Undi bark (Calophyllum inophyllum) is used as a fomentation in tenesmus ; the bark-juice, with an equal quantity of Máka-juice (Eclipta alba), boiled to one-half, is mixed with old Sesamum oil, a few pepper corns and ginger, heated, and applied in parotitis ; equal parts of the juice of the flowers and of those of Randia dumetorum are used as an application to bruises.

Ecbolium Linneanum, *Kurz., Wall. Pl. As. Rar.* 3, *t.* 108 ; *Bot. Mag., t.* 1847 ; *Syn.*—Justicia Ecbolium ; *Vern.*—Uda-jati (*Hind.*), Rân-aboli (*Mar.*), is a small shrub, very common in the Concan. The roots are prescribed in jaundice and menorrhagia.

Description.—Stems several, straight, jointed, and swelled above the joints ; woody and round below, quadrangular and tender above ; leaves elliptic-oblong, attenuated at both ends, pubescent, or glabrous ; spikes terminal, tetragonal ; bracts oval, quite entire, ciliated, mucronate, as long as the capsule ; flowers azure-coloured ; capsule half an inch long, 2-seeded.

Justicia Gendarussa, *Rheede, Hort. Mal. ix., t.* 42; *Jacq. Ecl., t.* 11 ; *Vern.*—Jagatmadan (*Beng.*), Teo (*Bomb.*), appears to have been confounded with some species of Vitex, as the qualities attributed to it by Ainslie, and in the Pharmacopœia of India do not seem to correspond with those possessed by the plant. In Bombay it is a well-known edging for flower beds, but I have never known it to be used medicinally. Europeans sometimes call it 'box,' which the native gardeners have corrupted into 'bakas.' It is the Vadakodí of Rheede.

Description.—In gardens it is usually seen in a stunted form, as it is kept closely cut; the young shoots have a smooth green or purple bark; from the joints, which are somewhat tumid, spring secondary shoots. The leaves are opposite, short-petioled, lanceolar, obtuse, frequently a little scalloped, smooth; nerve and veins purple, or green, according to the variety, from 3 to 6 inches long, and ½ to 1 inch broad; spikes terminal, erect; flowers dirty white, spotted with purple. The odour of the plant when crushed is ferny, the taste peculiar, and not disagreeable.

Blepharis edulis, *Pers., Burm. Fl. Ind., t.* 42; *Delile, Fl. Æg., t.* 33, *fig.* 3. The seeds.

Syn.—Acanthodium spicatum.

Vernacular.—Utanjan (*Hind.*), Utingan (*Bomb.*)

History, Uses, &c.—Under the local name of Utinjan and the Persian name Anjurah, an Acanthaceous seed is sold in the Bombay shops. From an examination of the capsules which are sometimes found mixed with the seeds there would appear to be little doubt that they are those of the plant placed at the head of this article. Utinjan is a standard native remedy, and is universally kept in the druggists' shops. The author of the Makhzan-el-Adwiya (article Anjurah) gives us the following account of it, from which it would appear that the true Anjurah is the Urtica prima of Matthiolas (U. pilulifera, *Linn.*),* and that the seeds now in use in India have somehow come to take the place of the genuine article. He says:—" Anjurah is a Persian word, it is the Karíz of the Arabs, the Kurnah of Shiraz, the Kajít of the Turks, the Utanjan of the Indians, the Urtikparim of Latin writers, and the Harkitah of Gilan. The plant has numerous serrate leaves, which are armed with prickles, the stem is still more prickly, when it comes in contact with the body it causes redness, burning and itching.

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* The Roman Nettle, Urtica prima, Matth. Valgr. v. 2, 469, f. It has brown polished seeds.

The flowers are yellow. The seed smooth and shining, flattened, of a brownish colour, larger than those of sesamum, and altogether not unlike linseed. They are the officinal part, and if good should be heavy and of a brown colour." Medicinally they are considered to be attenuant, resolvent, diuretic, aphrodisiac, expectorant, and deobstruent.*

Description.—The Utinjan of the Bombay shops consists of the seeds mixed with a large proportion of broken pieces of the capsule and a few entire fruits. The latter are mitre-shaped, about $\frac{3}{10}$ths of an inch long, and $\frac{2}{10}$ths broad, laterally compressed, sides furrowed, surface polished, of a chestnut colour; capsule 2-celled, 2-seeded; seeds heart-shaped, flat, covered with long, coarse hairs; when soaked in water the hairs disintegrate and produce a large quantity of viscid mucilage.

Microscopic structure.—Each hair is made up of several columnar cells, each of which contains a spiral fibre, which upon the solution of the cell wall uncoils and imparts an unusual stringiness to the mucilage.

Commerce.—Utinjan is imported into Bombay by way of the Red Sea. Value, Rs. 1¼ per lb.

The other Acanthaceous plants occasionally used medicinally are Lepidagathis cristata, *Vern.*—Bhuyaterada, as a bitter in fevers. Peristrophe bicalyculata, Rungia parviflora and Rungia repens as substitutes for fumitory; all three are called Pitpáprá in the vernacular. (S. Arjun.) Lepidagathis cristata is called by peasants about Bombay Kolí-che-chútar, the ashes are applied to cure itchy affections of the skin. The plant presents a very curious appearance owing to the spikes being all clustered about the root, forming a sub-globose head, hence the vulgar name Jackal's scut. The substitutes for fumitory are given in the Concan in combination with other drugs in bilious affections, *e.g.* Pitpáprá, Tinospora cordifolia, Cyperus pertenuis, Andrographis, Ginger, āā p. eq. in decoction.

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* Conf. Dios. iv., 89. *περὶ ακαλύφης*, also Galen; they recommend it as an expectorant.

VERBENACEÆ.

Tectona grandis, *Linn. f., Roxb. Cor. Pl.* 1, *t.* 6; *Rheede Hort. Mal. iv., t.* 27. The wood, fruit, and tar.

Vernacular.—Sagún(*Hind.*), Según (*Beng.*), Ságwân (*Bomb.*), Tekkumaram (*Tam.*)

History, Uses, &c.—The teak tree is the Sáka of Sanskrit writers and the Sáj of Arabic and Persian books on Indian Materia Medica. The natives recommend a plaster of the powdered wood in bilious headaches, and for the dispersion of inflammatory swellings; taken internally in doses of 90 to 200 grains it is said to be beneficial in dyspepsia with burning pain in the stomach arising from an overflow of bile, also as a vermifuge. The charred wood quenched in Poppy juice* and reduced to a smooth paste is applied to swellings of the eyelids, and is thought to strengthen the sight. The bark is used as an astringent, and the oil of the nuts, which is thick and has an agreeable odour, is used for making the hair grow, and removing itchiness of the skin. (Confer. Makhzan-el-Adwiya article "Sáj.")

Endlicher states that the flowers are diuretic; this is confirmed by Gibson, who says that the seeds have a similar property; in two cases he saw marked diuresis follow the application of an epithem of the bruised fruit to the pubes. In the Pharmacopœia of India a paste made from the powdered wood is said to allay the pain and inflammation caused by handling the Burmese black varnish which is obtained from Melanorrhæa usitatissima. Col. Burney (Journ. of Asiat. Soc. of Bengal Vol. I., p. 170,) has published some interesting remarks on its use. In the Concan a tar is extracted from the wood, which is used as an application to the sores of draught cattle to prevent maggots breeding in them.

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* The word used in the Makhzan is *Mamítha,* an Arabic name for the Argemone of the Greeks and Romans. Two kinds of Mâmitha are described by Arabic and Persian writers, one with red flowers, the other with yellow. (Conf. Dios. ii., 168, 169.) In India Argemone mexicana is used for Mámítha.

Description.—Trunk erect, growing to an immense size; bark ash-coloured and scaly; branches numerous, spreading; young shoots 4-sided, sides channelled; leaves opposite, petioled, spreading, oval, a little scalloped, above scabrous, below covered with whitish rather soft down, they are larger at a distance from the flowers, and on young trees, *viz.*, from 12 to 24 inches long, and from 8 to 16 broad; petioles short, thick, laterally compressed; panicles terminal, very large, cross-armed, divisions dichotomous, with a sessile fertile flower in each cleft, the whole covered with a hoary, farinaceous substance; peduncles common, quadrangular, sides deeply channelled, angles obtuse; bracts opposite, lanceolate, two at each subdivision; flowers small, white, very numerous; calyx and corolla oftener six than five cleft; nectary very small, frequently wanting; stamens often six; germ superior, round, hairy, four-celled, with one ovule in each attached to the axis; stigma 2-cleft, divided, obtuse, spreading; drupe within the enlarged, inflated, dry calyx obtusely 4-sided, woolly, spongy dry; nut exceedingly hard, 4-celled. (*Roxb.*) The wood has a peculiar aromatic odour. The tar obtained from it is black and opaque when properly made, but when prepared from partly dried wood it is mixed with the sap and forms a greyish brown emulsion. The seeds are of the size and shape of Sesamum seeds; they are very oily, but the difficulty of extracting them from the nuts would make the oil very expensive; it is a bland, fatty oil, free from any peculiar odour.

Chemical composition.—Teak wood often exhibits cracks and cavities lined with a white crystalline deposit, consisting chiefly of hydrocalcic orthophosphate, $Ca^{II}\,H\,PO^4$, H^2O, with about 11·4 per cent. ammonio-magnesian phosphate. (Abel, Chem. Soc. Qu. Journ. XV., 91.) The formation of this deposit shows that the wood contains a considerable quantity of phosphoric acid, and this is proved by the composition of the ash, *viz.*, $Ca\,O$ 31·35, $Mg.\,O$ 9·74, $Fe\,O$ 0·80, K^2O 1·47, Na^2O 0·04, $Si\,O^2$ 24·98, SO^3 2·22, P^2O^5 29·69, CO^2 0·01, Cl. 0·01. The percentages of carbon and hydrogen are higher than in most woods, and this together with the richness in calcium phosphate and silica, may perhaps account for the great hardness of the wood. (G. Thoms, Landw. Versuchs. St. xxii., 68, xxiii., 413; Watt's Dict. Chem., 3rd Suppl., p. 1894.)

Teak wood yields on distillation with water an opalescent distillate impregnated with resinous matter, but no trace of essential oil could be obtained when operating with 126 lbs. of fresh sawdust from Indian teak. For the extraction of the tar two earthen pots were used luted together, the upper with a perforated bottom contained the wood in chips; the product was a rather liquid black tar having much the odour of coal tar. One pound of the sawdust exhausted with alcohol yielded a resinous extract, which after having been well washed with hot water weighed half an ounce; the resin is black, and has the peculiar odour of the wood.

Clerodendron infortunatum, *Gärtn., Rheede Hort. Mal. ii, t.* 25; *Burm. Zey., t.* 29. *Vern.*—Bhándíra (*Sans.*), Bhant (*Hind.* and *Beng.*), Karí (*Bomb.*) The leaves of this plant are noticed in the Pharmacopœia of India as a cheap and efficient tonic and antiperiodic. They are also said to be used as a vermifuge. I have not seen them used medicinally in this part of the country, but there is no doubt that they are strongly bitter. The plant may be seen in many of the Bombay gardens, and it grows wild in the Southern Concan. It is an under shrub 3 to 4 feet high. The leaves when fully grown are from 8 to 10 inches long, and from 7 to 8 inches broad at the base, dark green, long-petioled, rounded, or ovate-cordate, edges dentate, hairy on both sides; hairs white, jointed; venation very prominent on the under surface; odour disagreeable; taste bitter. The inflorescence forms large, terminal cross-armed panicles, which appear in March; flowers white, streaked with pink, sweet-scented; after they have fallen the calyces enlarge and turn red. The plant grows freely and produces a large quantity of leaves.

Clerodendron Siphonanthus, *Br. Lam. Ill., t.* 79, *f.* 1; *Burm. Ind., t.* 43; *Wight Ill., t.* 173. *Vern.*—Bhárgi, Brahmayashtika (*Sans.*), Bhárangi (*Hind.*), Bámanhati (*Beng.*), Bhárangi (*Bomb.*) A tall, erect-growing, suffruticose plant with linear leaves arranged in whorls round the stem, and white or cream-coloured flowers, with very long tubes, is common in Bombay gardens, and is said to grow wild on the hills east of Ahmednagar. (Gibson.) The root is mentioned by Sanskrit writers as useful in asthma, cough, and scrofulous affections. Chakradatta mentions its use in combination with ginger as a remedy for asthma. In Bombay *Clerodendron serratum, Spr.*, is used for the same purposes and is known by the same name. The root is found in the shops cut into pieces about three inches long; they vary in size, the largest being seldom as much as one inch in diameter, often crooked, and twisted; the woody portion shows well marked concentric rings and conspicuous medullary rays; it is very white and tough. The bark has a light brown epidermis; both wood and bark abound in starch and are feebly bitter. In the Concan the fresh root is rubbed into a paste and applied to cure headache, and with honey it is dropped into the ear to cure ulceration.

Clerodendron inerme, *Gærtn., Rheede Hort. Mal. v., t.* 49; *Jacq. Col., t.* 4, *f.* 1; *Vern.*—Shengankuppi (*Tam.*), Ban-jai (*Hind.* and *Beng.*), Vana-jai (*Bomb.*), is a weak, climbing, branched shrub, common in salt ground about Bombay. The leaves are small, from 1 to 2 inches long, smooth, shining, fleshy, oval or elliptic, both sides dotted with numerous minute dark-green dots; they have a rather agreeable acid and bitter flavour. The plant has a reputation as a febrifuge in remittent and intermittent fevers. The juice of the leaves is administered.

Clerodendron phlomoides, *Linn. f., Burm. Ind., t.* 45, *f.* 1; *Wight Ic., t.* 1473; Airan (*Bomb.*), is a large shrub common in hedges, with opposite, ovate, membranaceous, irregularly serrate leaves; and white fragrant flowers in terminal panicles, which appear in the cold weather. The root is considered by the natives of Western India to have alterative properties. I have never seen it used.

Gmelina. Several species belonging to this genus appear to be sometimes used as demulcents. I have no experience of their use. (Confer. Phar. of India, p. 164.) G. arborea, *Roxb., Cor. Pl.* 3, *t.* 246; Gambhári (*Sans.*), Shewan (*Bomb.*), is an ingredient of the Dasamula (see Tribulus terrestris) and is consequently prescribed in a number of diseases. In Bombay the juice of the young leaves is used as a demulcent in gonorrhœa, cough, &c., alone or with other demulcents.

Lippia nodiflora, *Rich., Lam. Ill., t.* 17, *f.* 3; *Wight Ic., t.* 1463; *Vern.*—Vashira (*Sans.*), Bhúi-okra (*Hind.*), Ratolia (*Bomb.*), Podútalei (*Tam.*), is used in Bombay as a demulcent in gonorrhœa. Anslie has the following notice of it:—" The tender stalks and leaves, which are in a slight degree bitter, the native practitioners prescribe, when toasted, in infusion, in cases of children's indigestions, to the extent of two ounces twice daily; it is also sometimes ordered as a drink for women after lying in. The plant is a native of Southern Italy and Sicily, as well as India, and has at different times had very different appellations bestowed on it, it being the Blairia nodiflora of Gærtner, and the Zapania nodiflora of Lamark, and the Vervena capitata of Forskahl. The stem is herbaceous, creeping, from 3 inches to a foot in length, sub-divided, rounded, marked with lines and smooth. The spike is terminating, roundish, composed of small whitish or rose-coloured flowers; it has two seeds, roundish, flatter on one side than the other." (Materia Indica, Vol. II., p. 313.)

Vitex Negundo, *Linn.*, *Wight Ic. t.* 519; *Rheede Hort. Mal. ii., t.* 12.
Vitex trifolia, *Linn. f.*, *Bot. Mag. t.* 2187; *Rheede Hort. Mal. ii., t.* 11.
The leaves, root, and fruit.

Vernacular.—Páni-ki-sambhálú (*Hind.*), Nir-nochchi (*Tam.*), Nírgundí, Kátrí, Lingúr (*Bomb.*), Nisinda (*Beng.*), Nírgari (*Guj.*)

History, Uses, &c.—Under the names Nírgundi and Sindhuvára Sanskrit writers describe two species of Vitex. The properties of both appear to be considered identical. The leaves are generally used as a discutient fomentation in sprains, rheumatism, swelled testicles, contusions, &c. The root is thought to be tonic, febrifuge and expectorant, and the fruit nervine, cephalic and emmenagogue.

Mahometan writers under the Arabic name of Athlak and Persian Panjangusht describe what they call the Agnis of the Greeks, and the Vitex of the Latins * and identify it with the Sambhálú of India. The latter article as sold in the Bombay shops is certainly the fruit of a Vitex, but not that of V. Negundo or trifolia, being less than half its size. Athlak is said to be astringent, resolvent, and attenuant, and is directed to be used both externally and internally in cases similar to those already mentioned.

It would appear then that the true Athlak† of the Arabian writers is the Vitex agnus castus of Europeans.

V. trifolia, *Linn.*, is highly extolled by Bontius. (Diseases of India, p. 226.) He speaks of it as anodyne, diuretic and emmenagogue, and testifies to the value of fomentations and baths prepared with 'this noble herb,' as he terms it, in the treatment of Beri-beri, and in the allied and obscure affection burning of the feet in natives. Of V. Negundo, Fleming remarks (Asiat. Researches, Vol. XI.,) that its leaves have a better claim to the title of discutient than any other vegetable remedy with which he is acquainted. The mode of application followed by the natives is to put the fresh leaves into an earthen pot and heat them over the fire till they are as hot as can be borne without pain; they are then applied to the affected part, and kept *in situ* by a bandage; the application is repeated three or four times a day until the swelling subsides. Dr. Hove (1787) tells us that the Europeans in Bombay call it the fomentation shrub, and that it is used in the hospitals there as a foment in contractions of the limbs occasioned by the land winds. In the Concan the juice of the leaves of Kátrí, Máká and Tulsí is extracted, and Ajwán seeds are bruised and steeped in it, and given in doses of six massas for rheumatism. The juice in half tolá doses with ghi and black pepper is also given, and in splenic enlargement 2 tolás of the juice with 2 tolás of cow's urine is given every morning. A very interesting account of the treatment of febrile, catarrhal, and rheumatic affections, as practised by the people of Mysore, by means of a sort of rude vapour bath prepared with this plant, is furnished by Dr. W. Ingledew. (Edin. Med and Surg. Journ., Oct., 1817, p. 530.) Roxburgh mentions the use of baths prepared with the aromatic leaves in the puerperal state of women in India. According to Ainslie the Mahometans are in the habit of smoking the dried leaves in cases of headache and catarrh. The dried fruit is deemed vermifuge. (Phar. of India, p. 163.)

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* Pliny 24, 9.

† Also called in Arabic, Zu khamsata aurák, 'The five-leaved,' and in Egypt Kaf Miriyam, 'The hand of Mary.'

Description.—A shrub growing in patches; branchlets, panicle, and under side of the leaves white, with a fine tomentum; leaves petioled, 3 to 5 foliolate; leaflets lanceolate, long, acuminated, entire, or coarsely cut and crenated; panicle terminal, pyramidal; flowers light blue; berry black, the size of a pea. (Bombay Flora, p. 201.) The habit of the shrub is variable; when growing near the sea it has almost always 3-foliolate entire leaves, the leaflets being attenuated into the petioles. Inland, the shrub has a more delicate appearance ; the petioles of the leaves are much longer ; the leaflets from 3 to 5 in number are often serrated ; the flowers do not vary. The serrated variety is preferred for medicinal purposes, and is called Kátrí. The leaves of both varieties appear to me to be equally aromatic; the odour reminds one of the English Bogmyrtle (Myrica Gale, *Linn.*) ; the taste is bitter and nauseous. The berry is very feebly aromatic. In Anthony Collin's French Translation of Clusius, Lyons, 1602, there are figures of both plants, which, though old and quaint, represent the general appearance very fairly.

Chemical composition.—Nothing is known of the chemistry of these plants, but the seed of V. Agnus castus is said to contain a peculiar bitter principle called Castine, a volatile acrid substance, a large quantity of free acid and fat oil. In Greece the fresh and rather unripe berries are said to be added to the must of the grape to render the wine more intoxicating, and prevent it from turning sour. (Landerer, Buchn.,) Repert. liv. 20 ; LXXXI. 229 ; Buchn. N. Repert. III. 392.)

Vitex sp.? Hab-el-fakad (*Arab.*), Tukm-i-panjangusht, (*Pers.*), Shambhálú-ka-bij (*Hind.*), Rènuka-bij (*Bomb.*) This small fruit is considered by native physicians to be astringent, resolvent and deobstruent, and useful for removing obstructions of the brain and liver. It is also given in enlargement of the spleen and dropsy.*

Description.—A small, dull gray, ovoid fruit, the size of a duckshot, half enclosed in the calyx, to which a portion of the peduncle remains attached. Upon section it is found to be extremely hard, and if perfect to consist of four cells, each containing a small flat seed. Generally one or more of the cells are abortive. The drug is imported from the West, and is probably the fruit of V. Agnus castus. Value, Re. ¼ per lb.

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* Compare with Dios. *περὶ ἄγνου* i., 120 ; Hippocrates also mentions *ἄγνος* ; it is the *λύγος* of earlier writers, and the Agnus castus of Pliny (24, 38).

Viburnum fœtidum, *Wallich, Pl. As. Rar., Vol. I., p.* 49, *tab.* 61.

Vernacular.—Nárwel (*Bomb.*) This shrub or small tree is not a native of Western India, but is very common in gardens; all the green parts emit a peculiarly unpleasant odour. It is customary for Hindu women who have been confined to hang a branch over the door of the room in which they lie, as a protection against evil spirits and post-partum hæmorrhage. Another superstition is, that if seven pieces of the stem of this plant are knotted into a thread made from cotton picked by a virgin, the necklace thus formed will cure scrofulous glands. A cake made from the flour of eighteen different kinds of grain with Nárwel juice, is scraped while hot on one side, well moistened with the juice and applied to the head in headache. A wineglassful of the juice of the leaves is administered internally in menorrhagia daily, also in post-partum hæmorrhage. It is remarkable that V. prunifolium, an American plant, has also been found useful in all uterine diseases characterised by loss of blood and in threatened abortion. Wallich states that V. fœtidum is a native of Burmah; he found it growing on the top of Mount Toong Dong near Ava. How it was introduced into Western India is not known. It seldom flowers or fruits here. The flowers are small and greenish white; the berries small, ovoid and of a vivid red colour. Leaves variable, usually ovate-lanceolate, serrated, length 1½ to 2 inches.

Chemical composition of the Viburnums.—The Viburnic acid of Krämer (1844) obtained from the bark of V. opulus was proved by Monro (1845) to be identical with Valerianic acid. The Viburnin of Krämer is a light yellowish mass or whitish powder of a neutral reaction, and of a purely bitter taste ; it is slightly soluble in water and more freely so in alcohol. Enz (1863) found in the fruit of V. lantana a hygroscopic neutral bitter principle readily soluble in water, also valerianic, acetic, tartaric and tannic acids. Nothing definite is known of the medical uses of the Viburnums. In North America they are supposed to prevent abortion, particularly when attempted by the use of cotton root. (Stillé and Maisch. National Disp.)

Premna integrifolia, *Linn., Wight Ic., t.* 1469.

Syn.—P. serratifolia.

Vernacular—Agnimantha. Ganikáriká (*Sans.*), Agetha, Arni (*Hind.*), Arni, Nárvel (*Bom.*), Bhut-birarvi (*Beng.*), Munni-vayr (*Tam.*), is considered to have the same properties as Viburnum fœtidum, and is used in a similar manner. Its root is one of the ingredients of the Dasamula, and the leaves are a popular remedy in the exanthematous fevers. Ainslie tells us that the root has a warm bitter taste and agreeable smell, and is prescribed in decoction as a gentle cordial and stomachic in fevers. Rheede calls the plant *Appel,* and notices the use of a decoction of the leaves for flatulence. Ainslie also remarks that it is the *Folium hirci* of Rumphius (Amb. iii., p. 28, t. 134), and that Burman calls it *Cornutia corymbosa* and Herman *Sambucus odorata aromatica.* In Ceylon it is known as Maha-midi. (Burm. Ind., t. 41, f. 1.) Atkinson adds that the leaves rubbed with pepper are administered in colds and fevers, and that externally a decoction of the whole plant is used in rheumatism and neuralgia. (Calcutta Ex. Cat., p. 228.)

Description.—A large shrub or small tree, blossoming in July and August. The whole plant has a heavy unpleasant smell. Trunk short; branches numerous; bark smooth, dark brown, leaves opposite, petioled, cordate, serrate on the anterior margins, acute pointed, smooth on both sides, from 1 to 6 inches long and from 1 to 3 inches broad; flowers in corymbs, terminal or between two branchlets, primary divisions opposite, the last two-forked, flowers minute, numerous, of a pale greenish-white (*Roxb.*); berries black, the size of a pea. Grows on waste ground on Malabar Hill, Bombay. Probably introduced by birds, who are fond of the berries; it is not noticed in the Bombay Flora, but seems to be the P. integrifolia of Graham. (Bomb. Plants, p. 155.)

Callicarpa lanata, *Linn., Wight Ic., t.* 1480. The bark.

Vernacular.—Bastra (*Hind.*), Massandari (*Beng.*), Koat-komal (*Tam.*), Aisar (*Bomb.*)

Ainslie says that the bark has a peculiar sub-aromatic and slightly bitter taste, and is chewed by the Cingalese when they cannot obtain Betel leaves. C. lanata is a tall shrub, common on the Western Ghauts, with opposite, cordate, acuminate, wrinkled leaves, white and downy underneath; it flowers in February and March in very small axillary cymes of a pale red colour; the calyx, peduncles and young branches are all woolly. It is to be found at Kandalla and Mahableshwar, and requires examination with respect to its bitter and aromatic properties. The Sanskrit name is Mashandari.

LABIATÆ.

Ocimum sanctum, *Linn., Burm. Thes. Zeyl.* 174, *t.* 80, *f.* 2. The leaves, root, and seeds.

Vernacular.—Tulsi (*Hind., Beng.,* and *Bomb.*), Tulashi (*Tam.*)

History, Uses, &c.—Dutt informs us (Hindu Mat. Med., p. 219,) that "Sanskrit writers make two varieties of this plant (founded upon some difference in the colour of their leaves), namely, white and black." I am inclined to think that this difference in the colour of the foliage depends upon soil and situation. The plant, irrespective of colour, is called in Sanskrit

Tulasi and Parnasa; it is sacred to Vishnu, and may be often seen occupying a prominent position in the front of Hindu houses; when thus kept it has to be watered and worshipped daily. Under favourable circumstances the plant grows to a considerable size, and furnishes woody stems large enough to make beads of. These beads are made into rosaries by the Hindus. Medicinally the leaves are said to be expectorant, and are prescribed in catarrhal affections. The dried leaves powdered are used as a snuff in a disease called peenash (ozœna). Ainslie mentions the use of the root in decoction in febrile affections. In the Concan a decoction of the leaves with the flowers of Careya arborea and black pepper is given in remittent fever. Tulsi is also an ingredient in prescriptions for rheumatism. (See Vitex trifolia.) The seeds are mucilaginous and demulcent.

Description.—Stem short, woody, perennial; branches numerous, opposite, round, usually dark purple, hairy; leaves opposite, petioled, oval, serrate, downy, about 1½ inch long and 1 inch broad; racemes terminal, erect, usually dark-purple, hairy, 4-sided; bracts opposite, petioled, cordate, reflex, 3-flowered; seeds black, oblong, about $\frac{1}{16}$th of an inch long, slightly arched on one side and flattened on the other, blunt-pointed.

Ocimum basilicum, *Linn., Rheede Hort. Mal. x., t.* 87, *Syn.*—Ocimum pilosum, affords the seeds known in Bombay as Tukm-i-ríhán; they are small, black, oblong, barely $\frac{1}{16}$th of an inch long, slightly arched on one side and flattened on the other, blunt-pointed. At the base there is a small projection with a white point, where the seed was attached to the ovary. They have no odour. The taste is oily, and slightly pungent. When placed in water or in the mouth they immediately become thickly coated with semi-opaque mucilage. Roxburgh describes it as a native of India, and gives the

Bengalí name as '*Babooi toolsi*'; he also notices the medicinal use of the seeds. Large quantities of the seed are imported from the Persian Gulf. The Bombay druggists corrupt the name into Takmeria. Steeped in water the drug forms a mucilaginous jelly, which is used as a demulcent. O. basilicum is probably the ὤκιμον of the Greeks; it is a native of Persia, but is cultivated in Greece. It is the Bádranj of Ibn Sina. Distilled with water, it yields about 1·56 per cent. of a yellowish-green oil, lighter than water (Raybaud, J., Pharm. 20, 447), which, when kept, solidifies almost wholly, as crystallised *basil-camphor*; the solid oil crystallised from alcohol forms 4-sided prisms, having a faint smell and taste; crystallised from water, it forms white, transparent, nearly tasteless tetrahedrons. It is neutral. Form. $C^{20} H^{16}$ 6 HO. (Bonastre; Dumas and Peligot in Gmelin's Handbook, 14, 359.)

The price of the seeds in Bombay is Rs. 4 per maund of 37½ lbs.

Ocimum gratissimum, *Linn., Jacq. Icon. Pl. Rar.* 3, *t.* 495, is the Rám-tulsi of Hindustan and the Rán-tulsi of Bombay. According to Roxburgh it is only found cultivated in Bengal, but in Western India it is a common wild plant, as its name infers. The leaves have a remarkably grateful odour and taste, and are used as a remedy for gonorrhœa.

Description.—Stem erect, woody, perennial; bark ash-coloured; branches opposite, erect, 4-sided, when young smooth, glossy and green, whole height of the plant from 4 to 8 feet; leaves opposite, long-petioled, drooping, oblong, ventricose, remotely serrate, pointed, smooth on both sides, often 6 inches long, including the petiole, which is about a third of the whole; racemes terminal, pretty long, rigidly erect, with the verticels of six flowers pretty close; bracts short petioled, reflexed, cordate lanceolate; calyx, upper lip marked with three nerves; corol short, scarcely larger than the calyx, of a pale yellow underneath, oblong, concave, and entire; filaments longer than the corol, with a large tuft of dark yellow hairs on the joints of the large pair near the base. (*Roxb.*) This Ocimum is wrongly supposed to be identical with the Faranjmishk of Persia. There are several other Ocimums which have aromatic properties, but they are hardly of sufficient importance medicinally to require special notice. The *Ajganda* of the Vaids, which has a peppermint odour, appears to be a small variety of O. basilicum; it is common in the Concans, and I have received it from Poona.

Coleus aromaticus, *Benth., Wight Ill. ii., t.* 175; *Bot. Reg., t.* 1520. *Vern.*—Páshánabhedi (*Sans.*), Pathúrchúr (*Hind.* and *Beng.*), Owa (*Bomb.*) Although the latter name is in general use in Bombay, it is improperly applied to this plant, but is the name for Carum copticum. The leaves of C. aromaticus, which are broad, ovate-crenated, and very thick, are about 3 inches long, and thickly studded with hairs, which on the upper-surface are principally jointed and tapering, but a few are simple and surmounted by a globular, transparent, brilliant gland like a minute dewdrop. On the under-surface the glandular hairs are much the most numerous, and give rise to a frosted appearance. The epidermis is provided with numerous simple stomata. The venation is reticulate, and remarkably prominent on the under-surface of the leaf. A few oil globules are met with in the parenchyma, but the aroma is chiefly situated in the glandular hairs. The taste of the leaf is at first pleasantly aromatic, afterwards very pungent; the odour is agreeable and refreshing. In Bombay the Owa is found in almost every garden; it is often used with success in colic and dyspepsia, and is mixed with articles of food by the natives,* and with drinks by the Europeans, who call it Borage. In the Concan the crushed leaves are applied to relieve the pain and irritation caused by the sting of the centipede. I have never heard of its producing the intoxicating effects noticed in the Pharmacopœia of India on the authority of Dr. Wight and the Rev. J. Long; if it does, it must be when taken in a much larger quantity than is usual in Bombay.

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* Chopped with flour and made into small pellets, which are soaked in oil or butter and fried. Food prepared in this way is called भजें (Bhajen).

Anisochilus carnosus, *Wall., Rheede Hort. Mal. x., t.* 90; Kapúrawallí (*Tam.*), Panjíra, Kápúrlí (*Bomb.*), has stimulant, diaphoretic and expectorant properties. Ainslie informs us that the fresh juice of the leaves mixed with sugar-candy is prescribed by the Tamil physicians in cynanche, who also prepare with it in conjunction with the juices of other herbs and gingelly oil, a cooling liniment for the head. Dr. G. Bidie (Madras Quart. Med. Journ., 1862, Vol. V., p. 269,) describes it as a mild stimulant expectorant. Its properties depend upon a volatile oil.

Description.—Stem erect, tetragonal; leaves petioled, ovate-rounded, obtuse crenated, cordate at the base, or rounded, thick, fleshy, hoary and tomentose, or villous on both sides; spikes long peduncled, at length cylindric; floral leaves ovate-obtuse; upper lip of calyx acute, glabrous, membranaceous, ciliated on the margin; lower lip truncate, quite entire; corolla bilabiate; upper lip bluntly 3 to 4-cleft, lower lip entire; flowers lilac.

Pogostemon parviflorus, *Benth., Hook. Jour. Bot. ii.*, 336; *Syn.*—Pogostemon purpuricaulis; *Vernacular.*—Phángla Pángla (*Bomb.*), is a tall suffruticose perennial plant about six feet high, with a purplish smooth stem; leaves often six inches long, broadly ovate, acuminate, coarsely double-toothed, attenuated into the petiole, sub-glabrous; verticels dinudate, approximate; panicles axillary and terminal, lax, pyramidal; bracts ovate-lanceolate, equal to the calyx; seeds very small, black and shining. (Confer. Bombay Flora, p. 207.) The whole plant has a strong black currant odour, and is common in the Concan. The fresh leaves have a slightly pungent taste, and when bruised are applied as a cataplasm in order to clean wounds, and stimulate healthy granulation. The roots are reputed to be a remedy for the bite of the Phúrsa snake (Echis carinata); they are directed to be chewed, but as this plant like other labiates has simply stimulant properties, it is probable that Peppermint would be just as efficient. The bite of the Phúrsa, though very dangerous, is by no means always fatal.

Micromeria capitellata, *Benth., Hook. Journ. Bot. iv., p.* 109, is a small plant which is found on the banks of the Yeena, Mahableshwar. Dalzell, who first brought it to notice, says that in its aromatic and carminative properties it rivals the peppermint.

Description—Herbaceous; branches elongated, simple, slender, villous; leaves small, shortly petioled, ovate-obtuse, crenated, pubescent on both sides; verticels of flowers distant, dichotomously cymose, peduncled, few flowered, contracted into a kind of umbel; flowers minute. (*Bombay Flora,* p. 209.)

Anisomeles malabarica, *Br. Bot. Mag., t.* 2071; *Wight Ic., t.* 164; is pretty common on the Ghauts in the Bombay Presidency, but appears to be much better known in Southern India, where it is called Peyameratti in Tamil and Mogbira in Telugu. Rumphius, speaking of the juice of the plant, says: "Idem quoque succus cum binis guttis olei sesamini, propinatus prodest mirifice asthmaticis, vel tussi mala laborantibus, quem in finem syrupus quoque præparatur ex foliorum succo cum saccharo cocto." (Amb. tom. V., lib. VIII., cap. LXXV.) It is a native of Malabar, where it is called Karintoomba, and is noticed by Rheede. (Hort. Mal. X., p. 185, t. 93.) Wight, Ainslie, and others tell us that an infusion of the leaves is given to children in colic, dyspepsia, and fever arising from teething; in ague an infusion of the leaves is used to promote perspiration; a decoction of the plant, or the essential oil distilled from it is used externally in rheumatism. In Bombay I have not seen the plant used, but its properties are known to the villagers on the Ghauts.

Description.—Shrubby, 2 to 5 feet; branches obtuse angled; leaves ovate-lanceolate, crenately serrated at the upper part, entire below, about 5 inches long, and 1½ inch broad; calyx 5-cleft, thickly covered with long white rather viscid pubescence; upper lip of corolla entire, white, under one 3-cleft with the lateral divisions reflexed; anthers deep purple; whorls disposed in simple racemes.

Salvia plebeia, *Br.* The seeds.

Vernacular.—Sathi, Samúndar-sok (*Sind.*), Kammar-kas (*Bomb.*)

Description, Uses, &c.—The seeds of this plant are very small, round, smooth and of brown colour; they are valued on account of their mucilaginous properties, and are administered internally in gonorrhœa. As their Bombay name implies, they are supposed to have strengthening properties, and are given to promote the sexual powers like many other mucilaginous drugs. The plant is found in the Concan, Deccan and Sind, and the seeds are collected by the herbalists and brought for sale to the towns in small parcels containing a pound or less. The statement that the seeds are used for killing vermin appears to be a mistake.

Leonotis nepetœfolia, *Br. Bot. Reg., t.* 281; *Wight Ic., t.* 867; *Vern.*—Hejur-chei (*Beng.*), Mátijer, Mátisúl (*Bomb.*), Dípmal (*Mar.*), is a large and conspicuous annual common in the neighbourhood of villages. It is easily recognised by its globular spinous heads of orange-coloured flowers. Roxburgh gives the following description of the plant :—" Stem annual, straight, four-sided, simple, from 4 to 6 feet high. Leaves opposite, spreading, petioled, cordate, serrate, pointed, downy, from 4 to 8 inches long, and 2 to 3 broad. Floral leaves (bractes verticillorum) lanceolate, depending. Petioles channelled, winged with the decurrent leaf ; verticels globular, 2, 3 or 4, towards the apex of the plant about 5 inches asunder Involucres many, subulate. Flowers numerous, of a deep rich orange colour. Calyx, 10-striated, 8-toothed; corol, under lip very short, 3-toothed, at all times of a dirty withered colour."

The ashes of the flower heads mixed with curds are applied in Bombay to ringworm and other itchy diseases of the skin.

Zufah-i-yabis.* From an examination of the drug this appears to be a small plant, 6 to 8 inches high ; stem not thicker than a crow-quill, 4-angled, purplish, branched from the base, which is woody ; root woody, seldom branched ; flower heads numerous, oblong ; calyx striated, hairy, purple, with five sharp teeth ; seeds naked, four in number, oblong, 3-angled, of a pale brown, studded with rows of small round tubercles ; on one side of the hilum there is a fringe of smaller tubercles very closely set, and on the other two elongated white prominences. As found in commerce the plant is much broken up ; it has a pleasant odour like sweet hay ; there are no leaves to be seen. Taste bitter ; properties, according to native writers, stimulant, anthelmintic, and deobstruent. The drug is generally attributed to Hyssopus officinalis, but this cannot be correct, as the flowers are in oblong spikes. It is imported from Persia, perhaps it is derived from Nepeta ciliaris, which is called Zúfah in Sind.

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* Sibthorp tells us that Satureia græca, *Linn.*, is the υσσοπο of the modern Greeks and the زوفه of the Turks.

Badranjboya, Baklat-el-Utrujiya (*Arab.*) Imported from Persia.

Description.—Calyx striated, hairy, 5-fid, not so long as that of Zúfah-i-yábis, and not coloured; seeds four, naked, brown, 3-angled, nearly smooth, a white patch on each side of the hilum; flowers in axillary clusters of about 6, upon a short peduncle; leaves ovate, margin deeply dentate, somewhat hairy. The drug is always much broken and consists chiefly of stem and fruit; the former is quadrangular, much larger than that of Zúfah, of a purplish tint. Taste bitter, odour faintly aromatic. This herb is supposed to represent the μελισσόφυλλον of Dioscorides and Theophrastus, generally known in Latin as Apiastrum. Virgil (G. 4, 63) calls it Melisphylla, and Theophrastus (4, 25) ἐνώδης μελίτεια. It is a plant beloved by bees, the Balm Gentle or Melissa officinalis of our gardens. When fresh it has a pleasant lemon odour, which is not retained by the dry plant. It was formerly valued as a corroborant in hypochondriacal affections, and the Persian drug is still used for this purpose by Indian hakíms. In Europe, Balm tea is still a domestic remedy, and is given as a grateful diluent in febrile affections: it has a place in the French Codex. The different species of Melissa are widely diffused, being found in Europe, Central Asia and North America.

Mishk-i-taramashia. Imported from Persia. It is a very small plant, 2 to 3 inches high; root as long as the plant, single, woody, with a few small fibres. The stems, which are 2 to 5 in number, are also woody, and branch from the ground; they are thickly set with leaves and flowers, which reach to the apex and form a spike. The leaves are linear-lanceolate, and have several prominent straight veins on each side of the midrib. The calyx, which is purple, encloses four oblong seeds of a brown colour, and is marked with numerous ribs, and ends in five sharply cut claws; it is studded with simple hairs, and is $\frac{3}{16}$ths of an inch long. The odour and taste of the drug is pleasant, like peppermint, but sweeter. Properties stimulant and carminative. Other names for it are Fahlui and Rang.

Lallemantia Royleana, *Benth.* Local name, Tukm-i-bálung. These seeds are generally supposed to be those of the abovementioned plant. As met with in commerce they are black, $\frac{1}{8}$th of an inch in length, oblong, smooth, 3-angled, tapering towards the umbilicus, which is marked by a white spot ; one side of the seed is broader than the other two, and slightly arched. The seeds when moistened become immediately coated with a tenacious, opaque, tasteless, grey mucilage.

Faranjmishk. Under this name a seed imported from Persia is sold in Bombay, which appears to be the seed of an Ocimum, but not of O. gratissimum, as stated in some books. The seeds in question are about $\frac{1}{12}$th of an inch in length, brown, oblong, smooth, 3-angled, tapering towards the umbilicus, which is marked by a white spot. When moistened they become coated with a transparent mucilage. The taste is feebly pungent. Faranjmishk is the Berengmish of the Arabians, which Sprengel refers to *Ocimum monachorum,* (O. sanctum). Serapion, after quoting a description of it by Ishak bin Amrán, says, "it is hot and dry in the end of the second degree, useful in coldness of the stomach, promotes digestion, is hepatic and cordial, dispels melancholy," &c. Ibn Sina has a similar account of it.

Mentha sylvestris, *Linn., Reichb. Ic. Fl. Germ., t.* 82. Local names, Púdína and Vartalau. The leaves of a mint mixed with portions of the stem, imported from Persia. In shape and odour these leaves resemble spearmint, but the stems are much smaller than those of Mentha viridis, as seen in gardens in Europe. The drug is used as a carminative, it is probably the ἡδύοσμον of the Greeks. Mentha sylvestris is very generally cultivated in gardens in the Concan, and is much used as a domestic remedy on account of its mildly stimulant and carminative properties. It is often made into a medicinal *Chutney*, which is eaten to remove a bad taste in the mouth in febrile conditions of the body, *e.g.*, Púdína, khárik (dry dates), black pepper, rock salt, raisins, and cummin in equal proportions are rubbed into a chutney with limejuice.

In colic mint juice with a little black pepper and honey is given.

The name μινθη, Mentha, is mentioned by Theophrastus (2, 4) and Pliny (19, 8), but it is uncertain to which species they allude.

Jadeh. The جعدة of the Arabian writers, is generally considered to be the Fúliyún (Polion) of the Greeks, by some supposed to be the Poley-Germander, Teucrium polium, *Linn.*; it is said to be deobstruent, diuretic, anthelmintic and tonic. (Confer. Dios. iii., 115; Plin. 21, 7; *ib.*, 20.) Dumolin, however, maintains the πόλιον of the Greeks and the Polium of Pliny to be Santolina chamœcyparissus, the "Lavender Cotton" of our gardens. Ibn Sina describes Jadeh as نوع من الشيح a kind of wormseed. Persian writers on Materia Medica give Gul-i-urba and Amberbed as synonyms for it. Dr. Peters brought a sample of Jadeh from Muscat, which consisted of the leaves and fruit of a species of Rue, but recently (1885), Dr. Jayakar, Civil Surgeon at Muscat, has informed me that there is a plant growing on the hills near that town which is called Jadeh, but that the Jadeh of the shops comes from Bunder Abbas. Both of Dr. Jayakar's specimens are woody, labiate plants, with linear leaves and terminal crowded spikes of flowers, both are densely covered with a cotton-like down, more especially the Persian specimen. The two plants are evidently very closely related; they are used in febrile affections by the Arabs, one ounce being steeped in cold water all night, and the infusion strained and taken in the morning. In infantile fevers the body is fumigated with the drug.

Description.—The Bunder Abbas Jadeh, as sold in the shops, consists of the flowers mixed with a few leaves and stems. The flowers are about $\frac{3}{16}$ths of an inch long, and only protrude a little from the cottony calyx; they are permanent and firmly attached to the seeds, which are black, rugose and somewhat kidney-shaped. The odour of the drug somewhat resembles that of wormseed, while that of the Arabian plant is more like lavender.

Satar. Mahometan writers on Materia Medica describe several kinds of this drug, and consider it to be the ὀρίγανον of the Greeks. It is much used in India as an agreeable aromatic and mild stimulant, and has many other properties ascribed to it, which it is unnecessary to recapitulate. The Satar of Bombay is imported from Muscat, and consists of small ovate, or nearly round, dotted, entire, rather leathery leaves, the largest of which are about $\frac{1}{4}$ inch long; mixed with them are portions of a slender woody stem, and numerous minute flowers, forming knotted clusters upon a slender spike; each flower is furnished with a small bract, and when magnified the bracts and calices are seen to be densely covered with jointed hairs. The calyx is unequally 4-cleft, the corolla labiate, and of a red colour, the calyx and flower after being soaked in water for 24 hours only measured $\frac{1}{8}$th inch in length. The leaves when magnified present a mossy surface, which is thickly pitted, each pit containing a granule of red, resinified essential oil. The dried herb has a fragrant thyme-like smell, it grows upon the hills of Oman near Muscat, and is a stunted woody shrub from one to two feet high. Dr. Jayakar of Muscat forwarded flowering plants in May 1885 which were sent to Kew, and have been identified as Zataria multiflora, *Boiss.*

Leucas cephalotes, *Spr., Desf. Mem. Mus. II., t* 4; *Vern.*—Tumba, has mild stimulant and diaphoretic properties, and is much used medicinally. In the cough or catarrh of children, Tumba juice 1 part, with 2 parts of honey and a few grains of Borax may be mixed, and a few drops given occasionally, and in intestinal catarrh 6 drops of the juice may be given with a little powdered Khárik (dry date.) In Poona, Leucas linifolia, *Benth., Jacq. Icon. Pl. Rar.* 1, *t.* 111, is used under the name of Goma ; its name in Sanskrit is Dronapushpi.

Mentha canadensis, var. glabrata.* The essential oil.

Vernacular.—Púdína (*Hind.* and *Bomb.*)

History, Uses, &c.—Oil of Peppermint, and Menthol in colourless hexagonal crystals, are both imported into Bombay in considerable quantities from China. It would appear that the oil is distilled at Canton, but I have no information upon this subject, nor do I know how long the industry has been carried on. The Chinese oil is high coloured and very pungent, and has not the delicate flavour of the best English oil, but for all practical purposes it may be considered a perfect substitute for it. Peppermint is much used by the vegetarians of India.

Chemical composition.—Chinese oil of peppermint when exposed to cold deposits colourless hexagonal crystals of peppermint camphor or menthol ($C^{10} H^{18} + H^2O$) in considerable quantity, and in this respect it differs from the European oil, which only occasionally produces crystals. Menthol boils at 210° C., and has a strong odour and taste of peppermint; it is lævogyre. The liquid part of oil of peppermint has not been chemically investigated.

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* The peppermint of the Bombay gardens is Mentha incana, *Willd.* No oil is extracted from it, but the fresh herb is used medicinally.

Commerce.—The oil comes from China in quarter catty bottles, with a Chinese label. Four of these bottles are generally packed in a tin box. Value, Rs. 8 to 10 per lb. Value of Menthol, Rs. 16 per catty.

Lavandula Stoechas, *Linn., Tourn. Ins., t.* 95. Ustúkhúdús (*Arab.* and *Bomb.*), Dhárú (*Hind*), is a regular article of import. Dioscorides tells us that it is called Stœchas from its growing at the Stoechades, a group of islands on the South Coast of Gaul near Massilia, now called Isles d'Hyères. It is the اسطا دوس or اسطيقوس of Ibn Sina. It is much used by native practitioners, who consider it to be resolvent, deobstruent and carminative, and prescribe it in chest affections; they also think that it assists in expelling bilious and phlegmatic humors.[*] The article is easily distinguished from L. vera by its large flowers. In Bombay it is also known as *Alphajan,* which is a corruption of the Portuguese name. No oil of Lavender is met with in the bazaars except that which is imported from Europe.

Value, Rs. 8 per maund of 37½ lbs.

Origanum Marjorana, *Linn., Woodv. Med. Bot., t.* 165; *Vern.*—Marwa, is used as a remedy for colic internally, and in hot fomentation; an essential oil is also distilled from it for use as a perfume. Ὀρίγανον in modern Greek ριγανι is applied now as in ancient times to plants, of this genus, but O. marjorana is distinguished by the name σάμψυχον in Greek and Amaracus in Latin.

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[*] Conf. Dios. iii., 28, *περὶ στοιχάδος* and Paul. Ægin. VI., Plin. 27, 12.

Hasha. A labiate herb, also called Sátar-el-Hamír, and in Greek Túmos,* very downy, flowers small, purplish. It is reputed to be stimulant and diuretic, and is said to be found in great abundance near Jerusalem. (*Vide* Makhzan, article حاشا.)

Farasiyun. The πράσιον of the Greeks, and Marrubium of Latin writers, it is mentioned by Theophrastus (vi., 2), Dioscorides (iii., 60), Hippocrates (681, 3), Celsus (v., 11), Pliny (20,17). Ibn Sina and other Arabian writers notice the same plant and apparently copy their description of it from Dioscorides; it is doubtless Marrubium vulgare, *Linn.*, the white Horehound. Hakím Alí Gilání, in his commentary on the Kánún gives Souf-el-ard or Wool of the earth and Hashishat-el-kalb or Dog's herb as Arabic synonyms, and says it is the same as Kirath-i-jibali or Mountain Leek; in this respect he and other Persian writers appear to have been misled by the similarity between the two Greek words πράσιον and πράσον The Arabic names abovementioned seem very suitable to white Horehound, and probably have been applied to it. Indian writers on Materia Medica follow closely Dioscorides in their description of Farásiyún (πράσιον) and its uses, but some of them discard the idea of its being the same as the Mountain Leek, and identify it with Arusa (Adhatoda vasica), probably on account of its value as a remedy for cough. In truth we have no such drug as

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* θύμος, Thyme. Dios iii., 39, considered to be T. vulgaris. Many species of Thyme grow in Southern Europe. ἕρπυλλος is considered to be T. serpyllum and ζύγις T. zygis.

Horehound in the Indian shops; if demanded some substitute is given for it, either Arusa or an alliaceous plant (Farasiyún-i-piází), the source of which is uncertain. There are several wild species of Allium in Northern India and Persia of which little is known.

PLUMBAGINEÆ.

Plumbago zeylanica, *Linn.*, *Rheede Hort. Mal. x., t. 8.* The root.

Vernacular.—Chitrak (*Hind.*), Chita (*Beng.*), Chitra (*Bomb.*), Chittira (*Tam.*)

History, Uses, &c.—Dutt gives us the following summary, extracted from Sanskrit works, of the uses to which Chitraka is put :—" The root is said to increase the digestive power, to promote the appetite, and to be useful in dyspepsia, piles, anasarca, diarrhœa and skin diseases. It is much used as a stimulant adjunct to other preparations, in the form of a combination called Trimada, consisting of Plumbago root, Báberang (fruit of Embelia ribes), and the tubers of Cyperus pertenuis. It enters into the composition of numerous medicines for dyspepsia. The following is an illustration : Take of Plumbago root, Rock salt, Chebulic myrobalans and long pepper, equal parts; powder and mix. Dose about 40 grains. (Chakradatta.) A favourite medicine for flatulence is an old prescription of Susruta's called Shaddharanayoga. It is a powder composed of equal parts of the following substances : Plumbago root, seeds of Holarrhena antidysenterica, roots of Cissampelos Pereira, of Picrorrhiza Kurroa and Aconitum heterophyllum, Chebulic myrobalans. Dose about 1 drachm. The root of P. zeylanica is said to exercise a beneficial effect on piles, in which disease it is given in various combinations. One mode of administering it is as follows:—An earthen jar or pot is lined in its interior with a paste of the root, and curdled milk (dadhi) or Kanjika (rice vinegar) is prepared in this pot. Plumbago root reduced to a paste is applied to abscesses with the object of opening them. It enters also into the composition of several preparations used as caustics." (Hindu Materia Medica, p. 185.) In the Concan the following formula is used:—Chitrak root, Emblic myrobalans, small black myrobalans (Bal-hartaki), Long pepper, Pepper root, Rhubarb and Rock salt. Powder and give 6 massás with hot water every night at bed-time in flatulence with rheumatic pains.

In paralysis the bark, with Cratæva bark, Indian elm bark (Vávalá), Wild Moringa bark, and the bark of Vitex trifolia, is boiled in one part of white, and two of Black mustard oil, and applied. Mahometan writers treat of the drug under the name of Shítaraj, a corruption of the Hindustani Chitrak; they describe it as caustic and vesicant, an expellant of phlegmatic humors; useful in rheumatism and spleen, digestive; it also causes abortion. For external administration it is made into a paste with milk, vinegar or salt and water. Such a paste may be applied externally in leprosy and other skin diseases of an obstinate character, and be allowed to remain until a blister has formed. In rheumatism it should be removed after 15 to 20 minutes. When administered internally the dose is one dirhem. Mír Muhammad Husain speaks of several kinds of Shítaraj, and says one of them is the Líbádiyún or Lífádiyún of the Greeks. Rhazes describes two kinds, Indian and Syrian.*

The Shítaraj of Mahometan writers must therefore be considered to refer to the genus Plumbago, and not to any particular species. P. zeylanica is mentioned by several European writers upon Indian drugs, but has not attracted the same amount of attention as P. rosea which, is said to be more active. However this may be, the former is the Chitrak of the native physicians, and very possibly may have been used by some under the supposition that it was the root of P. rosea. In the Pharmacopœia of India, Dr. Oswald is said to have employed P. zeylanica in the treatment of intermittents with good effect. It acts as a powerful sudorific. In the neighbourhood of Bombay this root is one of the most important drugs of the itinerant herbalist; it is also sold in the shops. Cases frequently occur in which it has been used to procure abortion, a piece being inserted into the os uteri.

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* Plumbago europæa is considered to be the *τριπόλιον* of Dioscorides by Sprengel. *λιβάδιον* is the Greek name of a plant mentioned by Pliny (25, 31), which has not I believe been identified by European writers with Plumbago.

Description.—The roots are from ¼ to ½ an inch in diameter, seldom branched. When dry the external surface of the bark is of a dark reddish brown colour, longitudinally striated and marked here and there by small warty projections; internally it is also brown and striated; the fracture short; the taste acrid and biting. Wood hard, reddish, close grained.

Microscopic structure.—A moist section of the bark is of a greenish yellow colour. The cells of the parenchyma are large, and filled with starch. There are numerous large bundles of bright yellow stony cells forming an irregular zone towards the inner part of the middle layer of the bark.

Chemical composition.—The activity of the drug is stated in the Pharmacopœia of India to depend upon the presence of plumbagin. This acrid principle has been separated from the root of Plumbago europæa. It is obtained by repeatedly boiling the ethereal extract of the root with water, whence it is deposited on cooling, and may be purified by crystallization from alcohol or ether-alcohol. It crystallizes in delicate needles or prisms, often grouped in tufts; has a styptic saccharine taste, with acrid biting after taste; melts very easily, and partly volatilises unaltered when heated. It is neutral, nearly insoluble in cold, more soluble in boiling water, very soluble in alcohol and ether. It dissolves with yellow colour in strong sulphuric and in fuming nitric acid, and is precipitated by water in yellow flocks. Alkalies change the colour of the solution to a fine cherry-red; acids restore the yellow colour. Basic acetate of lead also colours it red, and forms a crimson precipitate. (Dulong in Watts' Dict. of Chem., Vol. IV., p. 685.)

Commerce.—The shops are supplied by the herbalists, who collect the roots in this neighbourhood, where it is very common. Value, Rs. 4½ per maund of 37½ lbs.

Plumbago coccinea, *Boiss., Rheede Hort. Mal. xii., t.* 9; *Bot. Mag., t.* 230. The roots.

Vernacular.—Lál-chitrak (*Hind.*), Lál-chita (*Beng.*), Lál-chitra (*Bomb.*), Shivappu-chittira (*Tam.*)

History, Uses, &c.—Raktachitraka is mentioned by Sanskrit writers as an abortifacient and vesicant. Mahometan writers make a similar mention of it. It appears to be the Radix vesicatoria of Rumphius (Amb. V., p. 453, t. 163), the Schetti codiveli of Rheede (Mal. XII., t. 9), and the Shencoodie vaylie of Ainslie, who remarks that—"The bruised root of this plant is, in its natural state, acrid and stimulating, but when tempered with a little bland oil it is used as an external application in rheumatic and paralytic affections; it is also prescribed internally in small doses for the same complaints, in combination with some other simple powder." (Mat. Ind. II., p. 379.) O'Shaughnessy, who instituted a series of trials with the root as a vesicant, has expressed a very favourable opinion of it as a cheap substitute for cantharides. Dr. Waring thinks less favourably of it; he found that it caused more pain than an ordinary blister, and that the resulting vesication was less uniform, and not always easily healed. From what I have seen of its use I am inclined to support Dr. Waring's opinion. The plant is only to be found in gardens in Bombay, and is seldom used by the natives in this part of India, P. zeylanica taking its place.

Description.—Root branched, ¼ inch or more in diameter; bark thick, smooth, brown, marked with small warty prominences, exudes a yellow juice when cut; wood hard, yellowish; odour acrid and disagreeable.

Microscopic structure.—Commencing from the exterior the bark presents several rows of brick-shaped cork cells of a brown colour, within this is a parenchymatous tissue loaded with starch and permeated towards the inner part by yellow laticiferous vessels, just without these is an interrupted zone of yellow liber cells. The wood is porous, with strongly marked medullary rays.

Statice ægyptiaca, *Delisle, Bot. Mag., t.* 2363.

A small shrub with radical, alternately pinnatifid, sinuated leaves, intermediate segments of corolla linear ; flowers white.

Common in Sind, Afghanistan, Beloochistan, and Egypt. Leaves used in native practice as a febrifuge, and in diarrhœa. (Murray.)

SALVADORACEÆ.

Salvadora persica, *Garcin, Roxb. Cor. Pl.* 1, *t.* 26; *Wight Ic.*, 1621. The fruit and root-bark.

Vernacular.—Pilú, Jál (*Hind.* and *Beng.*), Kákhan (*Bomb.*), Kalarva, Kárkol (*Tam.*)

History, Uses, &c.—Several species of Salvadora grow upon the sea-coast of Persia and Western India ; collectively they are called Arák by the Arabs, and Darakht-i-miswak by the Persians. On the coast of Persia known as the Garmásír, they are known by the name of Chúch. The author of the Makhzan-el-Adwiya describes several species, and says that the fruits are sometimes eaten. He describes them as deobstruent, carminative and diuretic, and remarks that a poultice of the leaves which have similar properties, is used to relieve the pain of tumours, piles, &c. The wood of the tree which is used as a tooth-brush strengthens the gums. Forskahl in his 'Descriptiones Floræ Ægyptiaco-Arabicæ, p. 32, has the following notice of this Salvadora:—"In magno est pretío ; fructus (Kabath), maturus edulis ; folia contusa imponuntur tumoribus *uaram* dictis et bubonibus ; sed vis antitoxica adeo famosa, ut carmine quoque celebretur."

Ainslie gives Ooghai-puttay as the Tamil name of S. persica, and says, " the bark, which is a little warm and somewhat acrid, is recommended by the Hindu doctors, in decoction, in cases of low fever, and as a tonic and stimulant in amenorrhœa. The bark of the root when fresh bruised acts as a vesicatory." (Mat. Ind. II., p. 266.) In the Pharmacopœia of India, we are told, that Dr. Irvine employed the root-bark successfully as a vesicant. In Dr. Imlach's Report on Snake bites in Sind (Bomb. Med. Phys. Trans., Vol. III., N. S., p. 80,) several cases are mentioned in the tabular record, in which Pilú seeds were administered internally, with good effect. They are also said to be a favourite purgative. The tree is common in salt ground in Guzerat and to the south of Bombay, the leaves with those of Vitex trifolia are used by the country people as an external application in rheumatism; they are heated and tied up in thin cotton cloth.

Description.—S. persica is a small tree or shrub with a crooked trunk, seldom more than one foot in diameter; bark scabrous and cracked, whitish; branches numerous, spreading, their extremities pendulous, like those of the weeping willow; leaves opposite, petioled, oval or oblong, veinless, shining on both sides, fleshy, from 1 to 2 inches long, and one inch broad; flowers minute, greenish yellow, in terminal panicles from the exterior axils; berry very small, smooth, red, juicy, has a strong aromatic smell, and tastes like garden cress; seed solitary, erect.

The root-bark when fresh is of a light brown colour and nearly smooth, studded pretty thickly with scabrous corky warts, either single or arranged in transversely extended patches. The substance and inner surface of the bark is white and soft; fracture short; odour like cress; taste warm and pungent.

Microscopic structure.—The epidermis is formed of several rows of brick-shaped cells containing brown and green colouring matter, within this the cells of the parenchyma are brick-shaped and arranged in rows for some distance inward, afterwards the arrangement becomes more irregular and the cells are loaded with starch, a few oil globules, and crystals; towards the inner part of the bark are a few large yellow liber cells. The wood is porous; the vascular system composed of large, very fine dotted vessels. The medullary rays are remarkable for the number of large crystals contained in their cells.

Salvadora oleoides, *Dcne. Jacq. Voy. Bot., t.* 144.

Vernacular.—Kákhan. The oil Khákhanela is obtained from the seeds by expression, and is used as a stimulating application in painful rheumatic affections and after child-birth. The plant grows in the island of Salsette near Bombay. The oil is solid, of a bright green colour, and pungent odour, that sold in the shops is usually adulterated, it is of a greenish yellow colour, and of greater consistency than the genuine article. The berries of S. oleoides are larger than those of S. persica, and of a yellow colour when ripe. The root bark is used as a vesicant like that of S. persica. The tree is abundant in Sind, where it is called Kabar.

SOLANACEÆ.*

Datura alba, *Nees*, ⎧ *Rheede, Hort. Mal. ii., tt.* 29, 30.
,, **fastuosa**, *Linn.*, ⎩ The root, leaves and seeds.

Vernacular.—Safed-dhatura, Kálá-dhatura (*Hind.*, *Bomb.*, and *Beng.*), Umattai (*Tam.*)

History, Uses, &c.—The two species of Datura, as well as several varieties which have resulted from cultivation, are all included under the Sanskrit names Dhustura and Unmatta. Sanskrit writers describe the plant as beneficial in mental derangements, fever with catarrhal and cerebral complications, diarrhœa, skin diseases depending upon the presence of animal parasites, painful tumors, inflammation of the breasts, &c. A pill made of the pounded seeds is placed in decayed teeth to relieve toothache, and the leaves are smoked along with tobacco in asthma. According to Dutt no mention of the latter use of the plant is to be found in old Hindu books. Mahometan writers also are silent upon this point. Ainslie found upon enquiry that the physicians of Southern India were unacquainted with the value of Datura in spasmodic asthma, but he tells us that his friend Dr. Sherwood of Chittore noticed the smoking of D. fastuosa as a remedy in that disease. In the Concan the juice of D. alba is given with fresh curds in intermittent fever to the extent of one tolá during the intermission and at least two hours before the fever is expected. The several species of Datura are described by Mahometan writers under the Arabic name of Jouz-el-mathil. The Persian name is Tátúlah.* The author of the Makhzan recommends preference to be given to the purple kind; he says that all parts of the plant are powerfully intoxicating and narcotic; as a local application they relieve the pain of tumours, piles, &c. The roasted leaves applied to the eyes give relief in ophthalmia, similarly they are useful in headache, enlarged testicles, boils, &c. The following description of Datura intoxication is by the same author:—"Every thing he (the patient) looks at appears dark; he fancies that he really sees all the absurd impressions of his brain, his senses are deranged, he talks in a wild, disconnected manner, tries to walk but is unable, cannot sit straight, insects and reptiles float before his eyes, he tries to seize them, and laughs inordinately at his failure. His eyes are bloodshot, he sees with difficulty, and catches at his clothes and the furniture and walls of the room. In short, he has the appearance of a mad man." (Makhzan, article "Jouz-el-máthil.") On account of their intoxicating and stupefying effects, Dhatura seeds are frequently used in India for criminal purposes. An interesting account of Dhaturíás, or professional Dhatura poisoners, will be found in Chever's Jurisprudence. In Bombay country liquor is made more intoxicating by placing some of the seeds upon red hot charcoal, and inverting an earthen vessel over them; when this is full of the smoke, it is removed, filled with liquor, and tied down. The leaves and seeds of D. alba have been made official in the Pharmacopœia of India, of these a tincture, extract, plaster and poultice are directed to be made. The tincture of the seeds is highly recommended by the editor of that work as a substitute for opium. An extract of the leaves has been used successfully at the General Hospital, Madras, as a substitute for extract of belladonna. The value of the leaves as an application to painful nodes, tumours, &c., is well known to many European physicians in India.

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* Several kinds of *στρύχνος*, in Latin *Solanum*, were known to the ancients. Datura stramonium is by some supposed to be the *στρύχνος μανικὸς* of Theophrastus and Dioscorides, but I think this supposition improbable, as the plant does not agree with his description; moreover, it is very doubtful if it existed in Europe in the time of the ancient Roman Empire.

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* Datura stramonium is called τάτουλα in modern Greek, a name doubtless of Persian origin. This plant is a native of Northern Persia and Afghanistan, whence it appears to have been introduced into Europe some time before the discovery of America.

Description.—The fruit is about the size of a walnut and nearly globular, covered with sharp tubercles or short spines, the capsule does not dehisce, but splits in an irregular manner into numerous fragments. The seeds are ear-shaped, of a light yellowish brown colour. The testa is rugose and spongy. The ends of the cotyledons in the embryo are turned outwards, which enables them to be distinguished from those of other Solanaceous seeds. The tincture of the seed is not fluorescent. The leaves are from 6 to 10 inches in length, ovate-acuminate, unequal at the base, very coarsely dentate; they have a fetid odour.

Microscopic structure.—The outer envelope of the seed is formed of a layer of thick walled, sinuous cells, with numerous secondary deposits; the second of tangentially extended cells. The albumen consists of polyhedral cells containing granular matter and fatty oil. The structure of the embryo is similar, but the cells are much smaller.

Chemical composition.—The Indian Daturas do not appear to have been examined, but there can be little doubt that the plant contains the alkaloid Daturine which has been separated from D. Stramonium.

Commerce.—No part of the plant can be called an article of commerce, but the seeds are collected and sold by herbalists. Value nominal.

Datura sp. ? Local name Gharbhúli.

These are the immature capsules of a kind of thorn-apple, threaded upon a string and said to be imported from Persia. They are light brown and thickly set with longish prickles; about ¾ of an inch long; sometimes the peduncle remains attached; they do not correspond with the immature fruit of the Indian Daturás which grow in this part of the country. Dr. Watt thinks that they are probably the young fruits of D. Stramonium, *Linn.*, var. Tatula, a plant common around the villages of Afghanistan. The native name, which means "forgetfulness of home," indicates their physiological action. Mr. M. Sheriff states that in Madras the flowers or buds of D. alba and D. fastuosa are sold under this name. (See Appendix to the Pharmacopœia of India.)

Hyoscyamus niger, *Linn., Bentl. and Trim.* 194. } The
,, **albus,** *Linn., Blackw., t.* 111. } seeds.

Vernacular.—Khorasáni-ájwán (*Hind.*), Khorasáni-owa (*Bomb.*), Khorasáni-omam (*Tam.*)

History, Uses, &c.—Henbane, though a native of the Himalayas, was probably unknown to the ancient Hindu physicians. Parasika and Khorasáni yamani, the names which it bears in some recent Sanskrit works, indicate its foreign source. Mahometan writers call it Banj, an Arabic corruption of the Persian Bang; they say it is the Afíkún of the Greeks, the Azmálús of the Syrians, and the Katfít or Iskírás of the Moors; they also add that in the Deilami language it is called Kír-chak, because the capsules resemble a little basket with a cover, such as the Arabs make out of date leaves and call Kafír. Baron Hammer-Purgstall makes the following important observations: "Bendj, the plural of which in Coptic is 'nibendj,' is without doubt the same plant as the 'nepenthe,' which has hitherto so much perplexed the commentators of Homer. Helen evidently brought the nepenthe from Egypt, and bendj is there still reputed to possess all the wonderful qualities which Homer attributes to it." (Trébutien, "Contes Inédits des Mille et une Nuits, tome 1, p. 12, note.) Mír Muhammad Husain's description of Banj in the Makhzan agrees well with the genus Hyoscyamus. He says there are three kinds—white, black, and red,[*] and that the white is to be preferred; he mentions the preparation of a sun-dried extract from the juice of the fresh leaves, and says that the leaves are also pounded and made into a paste with flour, out of which small cakes are formed which when dry retain their medical properties for some time. Henbane is described by Eastern writers on Materia Medica as intoxicating, narcotic and anodyne; among the many uses to which it is put, the following may be mentioned as now peculiar to the East. A poultice of the juice with barley flour is used to relieve the pain of inflammatory swellings. The seeds in wine are applied to gouty enlargements, inflamed breasts, and swelled testicles. About half a drachm of the seeds with 1 drachm of poppy seeds is made into a mixture with honey and water, and given as an anodyne in cough, gout, &c.[†] Equal parts of the seeds and opium are said to be a powerful narcotic. A mixture of the powdered seeds with pitch is used to stop hollow teeth which are painful, and also as a pessary in painful affections of the uterus. The juice or a strong infusion of the seeds is dropped into the eye to relieve pain. Lastly, the seeds made into a paste with mare's milk and tied up in a piece of wild bull's skin, if worn by women, is said to prevent conception. Ainslie and other European writers upon Indian Materia Medica notice the use of Hyoscyamus seeds in India and attribute them to H. niger, but I have been unable to find that any one has raised this plant from the bazar seed.

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[*] Conf. Dios iv., 67. *περὶ νοσκυάμου.* Three kinds were known to the Greeks, *μελας* black, *λευκος* white, and *μηλοειδης* yellow. Hyoscyamus is called Altercum and Herba symphoniaca by Latin writers. In Palladius and other late writers we meet with the mutilated form Jusquiamus.

[†] Compare with Scrib. Comp. 89 to 93. The smoke of the burning seeds was inhaled by the ancients to cure toothache. (Scrib. Comp. 54.) Suffire autem oportet ore aperto alterci semine carbonibus asperso, subinde os colluere aqua calida, interdum enim quasi vermiculi quidam ejiciuntur. (See Solanum xanthocarpum.)

In the Mufaridát-i-Násari, it is distinctly stated that the officinal article should be the seeds of white Henbane (Bazr-el-banj-abiad). H. albus is generally considered to have been the Henbane of the ancients. Henbane (H. Niger) is cultivated for Government at the botanical gardens near Poona, where the extract is made to the extent of 170 lbs. annually. A species of Henbane, which appears to be H. reticulatus, very near to H. niger, grows abundantly about Quetta.

Description.—The bazar seed is reniform, laterally compressed, equal in size to that of H. niger, of a light brown or grey colour. The testa is finely reticulated. The albumen is oily. The embryo curved like the figure 9, the tail of the 9 being represented by the radicle. The taste is oily, bitter and acrid.

Microscopic structure.—The outer envelope of the seed is composed of a row of large cells the outer walls of which are thin but the lateral and interior very much thickened. The second layer is made up of very small cells tangentially extended and closely applied to one another. The cells of the albumen are polyhedral, and contain granular matter and oil globules.

Chemical composition.—The following account of the active principle is extracted from the Pharmacographia:—Hyoscyamine, the most important among the constituents of henbane, was obtained in an impure state by Geiger and Hesse in 1833. Höhn in 1871 first isolated it from the seeds, which are far richer in it than the leaves. The seeds are deprived of the fatty oil (26 per cent.) and treated with spirit of wine containing sulphuric acid, which takes out the hyoscyamine in the form of sulphate. The alcohol is then evaporated and tannic acid added; the precipitate thus obtained is mixed with lime and exhausted with alcohol. The hyoscyamine is again converted into sulphate, the aqueous solution of which is then precipitated with carbonate of sodium, and the alkaloid dissolved by means of ether. After the evaporation of the ether, hyoscyamine remains as an oily liquid, which after some time concretes into wart-like tufted crystals, soluble in benzol, chloroform, ether, as well as in water. Höhn and Reichardt assign to hyoscyamine the formula $C^{15} H^{23} N O^{3}$. The seeds yield of it only 0·05 per cent.

Hyoscyamine is easily decomposed by caustic alkalis. By boiling with baryta in aqueous solution, it is split into *Hyoscyne*, $C^{6} H^{13} N$, and *Hyoscinic Acid*, $C^{9} H^{10} O^{3}$. The former is a volatile oily liquid of a narcotic odour and alkaline reaction. By keeping it over sulphuric acid it crystallizes and also yields crystallized salts; hyoscine may be closely allied to conine, $C^{8} H^{15} N$. Hyoscinic acid is a crystallizable substance having an odour resembling that of empyreumatic benzoic acid. It melts, according to Hohn, at 105°, tropic acid melting at 118°, agrees so very nearly with hyoscinic acid that further researches will probably prove these acids to be identical.

Commerce.—The seed is imported from Persia. Value, Rs. 7 per maund of 37½ lbs.

Nicotiana Tabacum, *Linn., Blackw., t.* 146; *Bentl. and Trim., t.* 191. The leaves.

Vernacular.—Tambakú (*Hind., Beng.* and *Bomb.*), Pugaiilai (*Tam.*)

History, Uses, &c.—Tobacco is not mentioned in the latest Sanskrit works. Native historians tell us that it was introduced by the Portuguese from the New World, and was first known in Persia in the reign of Shah Abbas the Second, and in India towards the latter part of Akbar's reign (1605). The Emperor Jehangír, who succeeded him, mentions it in his own memoirs. Mahometan writers on Materia Medica call Tobacco a new remedy. The almost universal adoption of a foreign name is strong evidence that the plant was not known in the East before its introduction by the Portuguese. Native physicians consider the smoke to be disinfectant, and recommend it for fumigating cholera patients. Tobacco taken in various ways is said to purge the brain and stimulate mental activity. The smoke is calmative in asthma and other chest affections, and prevents costiveness if inhaled fasting. The ashes of the plant made into a paste with oil are a useful application to sores and wounds to prevent bleeding. The water from the *hookah* is diuretic, and the black oil which collects in the pipe stem is used on tents to heal up sinuses, and is dropped into the eye to cure night blindness and purulent conjunctivitis. Mír Mahammad Husain closes his notice of Tobacco by informing us that the better classes of English in India smoke the *hookah,* but in their own country they mostly take snuff, a few chew, and smoke pipes (the author of the Makhzan wrote about 100 years ago). Ainslie mentions the application of the leaves to the anus to promote the action of the bowels by the natives of Southern India. In the Concan a paste made with snuff, lime, and the powdered bark of Calophyllum inophyllum (undi) is applied in orchitis. Dr. Leith of Bombay was in the habit of applying a poultice of Tobacco leaves to the spine in tetanus with good results. The use of Tobacco is very general amongst the natives of India, even women and young children habitually smoke and chew it. The Gúrákú which is used in the *hookah* is essentially a mixture of Tobacco and Gúr (coarse sugar), in equal proportions, but the wealthier classes add other ingredients to it. This substance has the appearance of an extract; when used it is broken into fragments which are packed in the *chilam* and covered with a layer of live coals of wood, or rice balls specially prepared for the purpose. In Western India cigarettes rolled in the leaves of Bauhinia racemosa (Apta) or Diospyros exculpta (Timbúrí) are much used. Many among the labouring classes chew Tobacco along with their betel leaves and areca nut. Snuff-taking also is very common among all classes.

For a description of tobacco the reader is referred to standard works upon Materia Medica.

Chemical composition.—The following summary is extracted from the Pharmacographia:—" The active principle of Tobacco first isolated in 1828 by Posselt and Reimann, is a volatile alkaloid termed Nicotine, $C^{10} H^{14} N^{2}$. It is easily extracted from tobacco by means of alcohol or water, as a malate, from which the alkaloid can be separated by shaking it with caustic lye and ether. The ether is then expelled by warming the liquid, which finally has to be mixed with slaked lime and distilled in a stream of hydrogen, when the nicotine begins to come over at about 200° C.

"Nicotine is a colourless oily liquid, of sp. gr. 1·027 at 15° C., deviating the pole of polarization to the left; it boils at 247° C., and does not concrete even at 10° C. It has a strongly alkaline reaction, an unpleasant odour, and a burning taste. It quickly assumes a brown colour, on exposure to air and light; and appears even to undergo an alteration by repeated distillation in an atmosphere deprived of oxygen. Nicotine dissolves in water, but separates on addition of caustic potash. It occurs in the dried leaves to the extent of about 6 per cent., but is subject to great variation. The seeds of Hungarian tobacco are stated by Kosutany to contain from 0·28 to 0·67 per cent. of the alkaloid. It has not been met with in tobacco-smoke by Vohl and Eulenberg (1871), though other chemists assert its occurrence. The vapours were found by the former to contain numerous basic substances of the picolinic series, and ceded to caustic potash, hydrocyanic acid, sulphuretted hydrogen, several volatile fatty acids, phenol and creasote. There was further observed in the imperfect combustion of tobacco, the formation of laminæ fusible at 94° C., and having the composition $C^{19} H^{18}$.

"Tobacco leaves, whether fresh or dried, yield, when distilled with water, a turbid distillate in which, as observed by Hermbstadt in 1823, there are formed, after some days, crystals of Nicotianin or Tobacco Camphor. According to J. A. Barral, nicotianin contains 7·12 per cent. of nitrogen (?). By submitting 4 kilogrammes of tobacco of the previous year to distillation with much water, we obtained nicotianin, floating on the surface of the distillate, in the form of minute acicular crystals, which we found to be devoid of action on polarized light. The crystals have no peculiar taste, at least in the small quantity we tried; they have a tobacco-like smell, perhaps simply due to the water adhering to them. When an attempt was made to separate them by a filter, they entirely disappeared, being probably dissolved by an accompanying trace of essential oil˙ The clear water showed an alkaline reaction partly due to nicotine; this was proved by adding a solution of tannic acid, which caused a well-marked turbidity. Nicotianine is, in our opinion, a fatty acid contaminated with a little volatile oil.

"Among the ordinary constituents of leaves, tobacco contains albumin, resin, and gum. In smoking, these substances, as well as the cellulose of the thick midrib, would yield products not agreeable to the consumer. The manufacturer therefore discards the midrib, and endeavours by further preparation to ensure at least the partial destruction of these unwelcome constituents, as well as the formation of certain products of fermentation (ferment-oils), which may perhaps contribute to the aroma of tobacco, especially when saccharine substances, liquorice or alcohol, are added in the maceration to which tobacco is subjected.

"Tobacco leaves are remarkably rich in organic constituents, the proportion varying from 16 to 27 per cent. According to Boussingault, they contain when dry about 1 per cent. of phosphoric acid, and from 3 to 5 per cent. of potash, together with 2½ to 4½ per cent. of nitrogen partly in the form of nitrate, so that to enable the tobacco plant to flourish, it must have a rich soil or continual manuring.

"The lime, amounting to between a quarter and a half of the entire quantity of ash, is in the leaf combined with organic acids, especially malic, perhaps also citric. The proportion of potash varies greatly, but may amount to about 30 per cent. of the ash."

Commerce.—The total exports of *unmanufactured* tobacco from Bombay to Aden, Arabia, and the East Coast of Africa in 1881-82 were 41,87,921 lbs., valued at Rs. 4,92,314. Of *manufactured* tobacco the exports were 79,895 lbs., valued at Rs. 23,205; of this quantity Aden took 56,000 lbs. The balance was distributed among twenty-eight different countries, and probably consisted of small consignments of Indian cigars for the use of those who had acquired a taste for them in this country.

Solanum xanthocarpum, *Schrad., Jacq. Icon. Pl. Rar.* 2, *t.* 332. The plant.

Syn.—S. Jacquinii.

Vernacular.—Bhatkatya, Katai, Ringni (*Hind.*), Bhu-ringni (*Bomb.*), Kandan-kattiri (*Tam.*), Kantakári (*Beng.*)

History, Uses, &c.—This plant is an article of considerable importance in the Hindu Materia Medica, as it is one of the dasamula or ten plants (*vide* Tribulus terrestris) so much used in preparing a compound decoction by the Hindus. It is considered to have expectorant and diuretic properties, and is prescribed in asthma, cough, certain urinary affections, catarrhal fever, costiveness, &c. In Hindu practice the drug is generally combined with other expectorants, demulcents and aromatics. The following prescription from the Bhavaprakasha is extracted from "Dutt's Hindu Materia Medica":—Kantakáryavaleha, or electuary of S. Jacquinii. Take of Kantakári 12½ seers, water 64 seers, boil till reduced to one-fourth and strain. Boil the strained decoction till reduced to the consistence of a fluid extract, and add to it the following substances in fine powder, namely, Tinospora cordifolia, Piper chaba, Plumbago zeylanica, Cyperus rotundus, Rhus Kakrasingi, long pepper, black pepper, ginger, Alhagi maurorum, Clerodendron Siphonanthus, Vanda Roxburghii, and Zedoary root, each 8 tolás, sugar 2½ seers, sesamum oil and clarified butter each one seer. Boil together until reduced to the proper consistence. Lastly, add honey one seer, bamboo manna and long pepper in fine powder each half a seer.

Mahometan writers, under the Arabic name of Hadak, or the Persian Bádinján-i-barrí (wild egg plant), mention three kinds of Solanum, having somewhat similar properties. Their small kind, or Hejazí, appears to be the Solanum xanthocarpum, which they recommend in asthma, cough, dysuria, catarrhal fever, leprosy, costiveness and stone in the bladder. Under the Tamil name of Cundunghatrievayr, Ainslie notices the use of this drug in Southern India as an expectorant. The stems, flowers, and fruit, according to Dr. Wilson (Calcutta Med. Phys. Trans., Vol. II., p. 406), are bitter and carminative, and are prescribed in those forms of Ignipeditis, which are attended with a vesicular, watery eruption. Fumigations with the vapour of the burning seeds of this plant are in high repute in the cure of toothache; they are smoked in a chilam like tobacco. The ancients used the seeds of Henbane in the same way. (Scrib. Comp. 54.) It acts as a powerful sialogogue, and thus affords relief. (Confer. Phar. of India, p. 181.) In the Concan 2 tolás of the juice of the fresh plant with 2 tolás of Hemidesmus juice are given in whey as a diuretic, and the root with chiretta and ginger is given in decoction as a febrifuge. Dr. Peters informs me that in Bengal the plant is much used as a diuretic in dropsy.

Description.—Root at least biennial; stem none, but several flexuose, ramous branches, spreading close on the ground, for an extent of some feet, often striking root at the insertion of the leaves; angular, nearly void of pubescence; leaves frequently in pairs, oblong, pinnatifid, or laciniate, smooth, but armed on both sides with long, strong, straight spines; racemes between the leaves, and almost as long, bearing 4 to 6 alternate, pedicelled, large, bright blue flowers; calyx armed with straight spines; berries spherical, size of a large gooseberry, very smooth, drooping, while immature variegated with green and white, when ripe with different shades of yellow only. (*Roxb.*) No chemical examination of the plant appears to have been made.

Commerce.—The dried plant is kept in every druggist's shop in India. It is not an article of commerce, but is supplied by the herbalists as required.

Solanum indicum, *Linn., Rheede Hort. Mal. ii., t.* 36; *Burm. Zey., t.* 102; *Vern.*—Birhatta (*Hind.*), Motíringní, Dorlí (*Bomb.*), Mulli (*Tam.*), Byákura (*Beng.*), owes its importance to being one of the plants required for the preparation of the Dasamula Kvatha. It is called Vrihati and Bhantaki in Sanskrit, and does not appear to be used except in combination with more important drugs. According to the author of the Makhzan, it is cardiacal, aphrodisiacal, astringent, and resolvent ; useful in asthma, cough, chronic febrile affections, colic, flatulence, worms, &c. (Confer. Makhzan, article " Birhatta.")

Description.—Trunk trifling, but the branches are numerous, ligneous, and perennial, forming a large, very ramous shrub of several feet in height, armed with numerous, very acute, somewhat recurved spines, the young parts are downy ; leaves solitary, or in pairs, petioled, ovate-lobate, downy, and armed with a few straight spines on both sides, from 2 to 4 inches long; racemes between, or opposite to the leaves, supporting several long-pedicelled middle-sized, pale blue flowers ; calyx deeply 5-cleft, armed ; berries erect, round, smooth, size of a marrow fat pea ; while immature variegated with deeper and lighter green ; when ripe, with deep orange yellow. (*Roxb.*)

Solanum nigrum,* *Linn., Rheede Hort. Mal. x., t.* 73. The plant.

Vernacular.—Makoí (*Hind.*), Kámuní, Ghátí (*Bomb.*), Manattak-kali (*Tam.*), Kákmáchí (*Beng.*)

History, Uses, &c.—The plant is called Kákamáchí in Sanskrit works, and is described as having tonic, alterative and diuretic properties. Mahometan writers under the name of Anab-eth-thálib describe several kinds of Solanum, of which S. nigrum is probably one, but the fruit imported into Bombay from Persia under the name of Anab-eth-thálib appears to be that of Solanum dulcamara. In India the juice of S. nigrum is given in doses of from 6 to 8 ounces in the treatment of chronic enlargements of the liver, and is considered a valuable alterative and diuretic. The juice after expression is warmed in an earthen vessel until it loses its green colour and becomes reddish brown ; when cool it is strained and administered in the morning. It acts as a hydrogogue cathartic and diuretic.

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* Appears to agree well with the στρύχνος κηπαῖος of Dioscorides (iv., 69.) The Anab-eth-thalib of the Arabs includes S. nigrum and S. dulcamara.

Mr. M. Sheriff in his Supplement to the Pharmacopœia of India speaks very favourably of it when used in this way. In smaller doses (1 to 2 ozs.) it is a valuable alterative in chronic skin diseases, such as psoriasis. In the Concan the young shoots are cooked as a vegetable and given in these diseases. Dr. D. B. Master of Bombay has seen them used with great success in psoriasis.

Description.—An erect annual or biennial, stem angled, with spreading or diffuse branches, one to three feet high, glabrous, or pubescent, with simple hairs, without prickles, but the angles of the stem sometimes raised and smooth or rough with prominent tubercles ; leaves petiolate, ovate-oblong, attenuated at both ends, 1 to 3 inches long, entire or repandly toothed ; flowers small and white, in little cymes contracted into umbels on a common peduncle, from very short to nearly an inch long ; calyx 5-toothed or lobed to the middle ; corolla deeply lobed, 3 to 4 lines in diameter ; anthers very obtuse and short, opening in terminal slits, which are often continued down the sides ; berry small, globular, usually nearly black, but sometimes yellow or dingy red.

Chemical composition.—The alkaloid solanine was first obtained in 1820 by Defosses of Besancon from the berries of this plant. The same alkaloid was afterwards found in S. dulcamara. Winckler in 1841 observed that this alkaloid could only be obtained in an amorphous condition from the latter plant, and that it differed from the solanine of the potato. In 1858-59, Zwenger and Kind discovered that solanine, $C^{43} H^{69} NO^{16}$, was a compound of sugar and a crystallizable alkaloid, solanidine, $C^{25} H^{39} NO$. The latter under the action of strong hydrochloric acid parts with water and becomes converted into an amorphous basic compound, solinicine, $C^{50} H^{76} N^{2}O$.

Commerce.—The dried fruit of S. dulcamara, known as Anab-es-sálib in Bombay, comes from Persia. Value, Re. ¼ per lb.

S. nigrum is a common weed everywhere on cultivated ground. The dried fruit is met with in the shops in many parts of the country ; it may be given in infusion 1 oz. to a pint of boiling water ; dose 1 to 2 ozs.

Capsicum annuum, *Linn.*, *Bentl. and Trim.*, *t.* 189. The fruit.

Vernacular.—Lál-mirch (*Hind.*, *Bomb.* and *Beng.*), Milagáy (*Tam.*)

History, Uses, &c.—Chillies are not mentioned by any Sanskrit writers, consequently their introduction into India must have taken place at a comparatively recent date. It is probable that the Portuguese brought the fruit from the West Indies. Up to the present time the cultivation of the plant is carried on more extensively at Goa than at any other place on the Western Coast, and capsicums are well known in Bombay by the name of Gowai-mirchi (Goa pepper). The Arabs call Chillies Filfil-ahmar (Red pepper). The Persians Filfil-i-surkh, which has the same meaning. The Hindus and the Mahometans of India use large quantities of it in their food. The Arabians and Persians object to it. Medicinally the natives of India consider the capsicum to be stomachic and stimulant, and also use it externally as a rubefacient. The chillies of commerce in Bombay are of two kinds, Goa and Gháti. The former resembles the West Indian chilly; the latter is very long and tapers to a fine point. Other kinds are cultivated in gardens, viz., C. grossum, C. fastigiatum, and C. nipalense; the latter has yellow fruit, and from it is prepared a very highly esteemed Cayenne pepper having a peculiar flavour. C. fastigiatum, though common everywhere, is but little used in India.

Chillies are too well known to require description.

Microscopic structure.—The fleshy pericarp is composed of two layers, an outer consisting of thick walled cells, and an inner, which is a soft and spongy parenchyme traversed by fibro-vascular bundles. Most of the colouring matter is contained in the outer layer, which also contains some fatty oil.

Chemical composition.—The authors of the Pharmacographia give the following summary of what is known upon the subject:—"Bucholz in 1816, and about the same time Braconnot, traced the acridity of capsicum to a substance called Capsicin. It is obtained by treating the alcoholic extract with ether, and is a thick, yellowish red liquid, but slightly soluble in water. When gently heated, it becomes very fluid, and at a higher temperature is dissipated in fumes which are extremely irritating to respiration; it is evidently a mixed substance, consisting of resinous and fatty matters.

" Felletár, in 1869, exhausted capsicum fruits with dilute sulphuric acid, and distilled the decoction with potash. The distillate, which was strongly alkaline and smelt like conine, was saturated with sulphuric acid, evaporated to dryness, and exhausted with absolute alcohol. The solution after evaporation of the alcohol was treated with potash, and yielded by distillation a volatile alkaloid having the odour of conine.

" From experiments made by one of us (F.), we can fully confirm the observations of Felletár. We have obtained the volatile base in question, and find it to have the smell of conine. It occurs both in the pericarp and in the seeds, but in so small proportion that we were unsuccessful in isolating it in sufficient quantity to allow of accurate examination.

" Dragendorff states (1871) that petroleum ether is the best solvent for the alkaloid of capsicum; he obtained crystals of its hydrochlorate, the aqueous solution of which was precipitated by most of the usual tests, but not by tannic acid.

" The colouring matter of capsicum fruits is sparingly soluble in alcohol, but readily in chloroform. After evaporation an intensely red soft mass is obtained, which is not much altered by potash; it turns first blue, then black with concentrated sulphuric acid, like many other yellow-colouring substances. By alcohol chiefly *palmitic* acid is extracted from the fruit, as shown by Tresh in 1877.

" The fruits of Capsicum fasitgiatum have a somewhat strong odour; on distilling consecutively two quantities, each of 50 lbs., we obtained a scanty amount of flocculent fatty matter, which possesses an odour suggestive of parsley. Both this matter, as well as the distilled water, were neutral to litmus paper, and the water tasteless. We separated the latter and exposed the remaining greasy mass to a temperature of about 50° C., when it for the most part melted. The clear liquid on cooling solidified, and now consisted of tufted crystals, which we further purified by recrystallization from alcohol. Thus about 2 centigrammes were obtained of a neutral white stearoptene, having a decidedly aromatic, not very persistent taste, by no means acrid, but rather like that of the essential oil of parsley. The crystals melted at 38° C. On keeping them for some days at the temperature of the waterbath, covered with a watch-glass, some drops of essential oil were volatilized, which had the same taste and did not solidify ; the crystals were consequently accompanied by a liquid oil. When kept for some days more in that condition the crystals themselves began to be volatilized, and the part remaining behind acquired a brownish hue. This no doubt points out another impurity, as we ascertained by the following experiment :—With boiling solution of potash, the stearoptene produces a kind of soap, which on cooling yields a transparent jelly. If this is dissolved and diluted it becomes turbid by addition of an acid. This probably depends upon the presence of a little fatty matter, a suggestion which is confirmed by the somewhat offensive smell given off by our stearoptene if it is heated in a glass tube. Bucheim's 'Capsicol' is, in our opinion, a doubtful substance.

"Thresh (1876-77) succeeded in isolating a well-defined highly active principle, *Capsaicin*, from the extract which he obtained by exhausting Cayenne pepper with petroleum. From the red liquor dilute caustic lye removes capsaicin, which is to be precipitated in minute crystals by passing carbonic acid through the alkaline solution. They may be purified by crystallizing them from either alcohol, ether, benzine, glacial acetic acid, or hot bisulphide of carbon ; in petroleum capsaicin is but very sparingly soluble, yet dissolves abundantly on addition of fatty oil. The latter being present in the pericarp is the cause why capsaicin can be extracted by the above process. The crystals of capsaicin are colourless, and answer to the formula $C^9 H^{14} O^2$; they melt at 59° C., and begin to volatilize at 115° C., but decomposition can only be avoided by great care. The vapours of capsaicin are of the most dreadful acridity, and even the ordinary manipulation of that substance requires much precaution. Capsaicin is not a glucoside ; it is a powerful rubefacient, and taken internally produces very violent burning in the stomach." (*Op. cit.*, 2nd Ed., p. 453.)

Commerce.—Value, Gháti, Rs. 3½ per maund of 28 lbs. ; Gowai, Rs. 2½ to Rs. 4 per maund.

Physalis minima, *Linn.*, var. indica, *Rheede Hort. Mal. x., t.* 71.

Vernacular.—Thánmori, Nanvachi-wel (*Bomb.*), Ban-tepariya (*Beng.*), Tulati-pati (*Hind.*), Káknaj (*Punj.*), Kupanti (*Teling.*)

Description, Uses, &c.—Ainslie (2, 15,) in a note says that this plant has been noticed by Dr. Heyne as medicinal among the Hindus. Dr. Stewart informs us that the fruit is considered tonic, diuretic and purgative. It is the *Pee inota inodien* of Rheede. In the Concan the plant is made into a paste with rice water and applied to restore flaccid breasts, in accordance with the doctrine of signatures. P. minima is a small annual plant common on cultivated ground, with cordate serrated leaves, small yellow flowers, and an inflated calyx, containing a berry about the size of a pea, in which are numerous flat, reniform seeds.

Physalis indica, *Lam.*, *Vern.*—Phopéti, Chirboti, Kappárphodi (*Mar.*), is considered to be tonic, diuretic and purgative, and is an ingredient in a medicinal oil which is given for spleen, the other ingredients are Pokarmul, Hing, Hirda, Long pepper, Bidalawan (Black salt), Sendhav (Rock salt), Javakshara (ash of potash), ginger, and melted butter.

Withania somnifera,[*] *Dunal, Jacq. Ecl., t.* 22 *and* 23 ; *Wight Ic., t.* 853. The root.

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[*] Considered by some to be the *στρυχνος ὑπνωτικος* of Dioscorides and the Káknaj-el-manoum of the Arabs.

Vernacular.—Asgand (*Hind.*), Asvagandha (*Beng.* and *Bomb.*), Amkúlang (*Tam.*), Tilli (*Mar.*)

History, Uses, &c.—It is impossible to trace the history of the medicinal use of this plant, as it has universally been confounded with a root met with under the same name in the bazars, but which bears no resemblance to the root of W. somnifera. I will now proceed to describe the two articles :—

W. Somnifera, Dunal.—The plant consists of a stout, long tapering woody root, an inch or more in diameter, surmounted by a knotty crown, from which spring several shrubby, flexuose branches, which are generally round, and from 1 to 2 feet long. The leaves are double, ovate, variable in size, but not more than three inches long ; flowers axillary, subsessile, crowded at the ends of the branches ; corolla campanulate, yellowish green, very small ; berry red, smooth, size of a pea covered by a membranaceous closely fitting calyx, open at the apex ; seeds numerous, yellowish white, reniform, laterally compressed, about $\frac{1}{16}$th of an inch long ; testa honeycombed. The whole plant is covered with small branched and pointed white hairs which give it a hoary appearance. The odour is pungent and disagreeable like horse's urine ; this is expressed in the Sanskrit name Asvagandha. The root consists of a twisted, white, woody column, which is covered by a thickish soft bark, containing a good deal of red-colouring matter visible through the greyish epidermis.† The miscroscopic characters are not in any way remarkable. The fresh root-bark has the same odour as the plant ; the leaves and fruit taste a little bitter and nauseous.

We have no exact information regarding the physiological action of W. somnifera, but the authors of the Bombay Flora state that the root and leaves are powerfully narcotic and diuretic; and that the seeds are employed to coagulate milk like the Puneeria in Sind.

Asgand of the Shops.—This dry root is from 6 to 8 inches in length, often less, and from $\frac{1}{4}$ to $\frac{1}{2}$ in diameter at the thickest portion a little below the crown; it is plump, smooth, tapering, and of a light yellowish brown colour externally, white internally, brittle; fracture short and starchy. The root is seldom branched. Attached to the crown are the remains of several slender stems. Microscopic examination shows the substance of the root to be principally composed of starch, inclosed in delicate oval cells; the cortical portion is about $\frac{1}{20}$th inch in thickness. The vascular system consists of a large central bundle of scalariform and dotted vessels; round this several smaller bundles and single vessels are arranged in a radiating manner. Asgand has a mucilaginous and slightly bitter taste. In the Makhzan-el-Adwiya it is described as a tonic and alterative, and is said to have much the same properties as White Behen. There is no mention of its being a narcotic. The Makhzan describes it as an Indian root. The Asvagandha of Sanskrit writers is evidently the same article, and not W. somnifera. (Confer. Dutt's Hindu Materia Medica, p. 210.) Chakradatta recommends a paste of the root to be taken with milk and clarified butter to improve the nutrition of weakly children. I have since ascertained that Asgund is the tuber of a convolvulus, which though much smaller and different in habit, does not appear to differ botanically from Batatas paniculata.

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† *ῥιζαν φλοιὸν ἔχουσαν ὑπέρυθρον, ἐυμεγέθη* Dios. iv., 71.

Withania coagulans, *Dunal, Wight Ic., t.* 1616.

Vernacular.—Punírband, Punír-ja-fota (*Sind.*), Khamjaria (*Sutlej*), Spin-bajja (*Afghan.*), Akri (*Hind.*), Káknaj (*Bomb.*)

History, Uses, &c.—A small shrub common in Sind, N. W. India and Afghanistan, where the fruit is commonly used to coagulate milk instead of rennet; the natives of those countries rub up a few of the fruits with a small quantity of milk and add this to the milk to be coagulated. This useful plant appears to have attracted little notice until 1849, when it was described by Dr. Stocks (Journ. Bomb. Asiat. Soc., 1849, p. 55). The fruit is also used as an emetic, and smaller doses as a remedy for dyspepsia arising from chronic liver disease; it is alterative and diuretic. In Bombay it is usually confounded with the fruit of Physalis Alkekengi, *Wild.*, imported from Persia, the Hab-el-káknaj or Káknaj of the Arabians, which is described by Ibn Sina as an alterative similar to Dulcamara, and especially useful in skin diseases. The berries of both plants have a reputation as blood purifiers. Recently, from experiments made by Sir J. D. Hooker at Kew, it has been ascertained that 1 oz. of the fruit of Withania coagulans and 1 quart of boiling water make a decoction, one tablespoonful of which will coagulate a gallon of warm milk in about half an hour. Experiments of a similar nature have been made on the Kilkerran Estate, the property of Sir James Fergusson, late Governor of Bombay; four ounces of the fruit were allowed to simmer for 12 hours in 1½ pint of water, and half the liquid was then added to 55 gallons of milk; the milk curdled in an hour and a half, affording a firm curd free from taste and smell; of this a cheese was made which proved to be excellent.

Description.—The entire fruit is about ⅜ of an inch in diameter, flattened at the base and enclosed in a leathery close fitting calyx, with a small 5-partite opening at the apex, through which a small portion of the fruit is visible; this is red when fresh, but yellowish and chaffy when dry; within is a mass of flattened reniform seeds nearly ⅛ of an inch in their longest diameter, and held together by a viscid brown pulp which has a nauseous fruity odour.

The fruit of Physalis Alkekengi *Wild.*, is about the size, shape and colour of a small dried cherry, skin smooth and shining, reddish brown, much shrivelled; it contains a large number of flattened, reniform seeds of a light brown colour, and smaller than those of Withania coagulans; these are sticky from the presence of a small quantity of brown pulp, which has a fruity odour. Mír Muhammad Husain gives the following synonyms for Káknaj—Arúsak-pas-i-pardah (Bride behind the curtain), Kachuman and Kákanah (*Pers.*), Úsfandanún (*Yunani*), Askídúliyún (*Turk.*), Rájpútaka (*Hind.*) It is probably the στρύχνος ἁλικακάβος of Dioscorides, which he says is also called φυσαλίς (more correctly φυσαλλις).

Chemical composition.—The following information is extracted from a report upon the "rennet" ferment contained in the seeds, by Mr. Sheridan Lea :—

"Taking equal weights of the seeds, I extracted them for 24 hours with equal volumes of (1) water, (2) 5 per cent. sodic chloride, (3) 2 per cent. hydrochloric acid, (4) 3 per cent. sodic carbonate. Equal volumes of each of the above were added in an acid, alkaline, and neutral condition, to equal volumes of milk, and heated in a water-bath at 38° C. The milk was rapidly coagulated by the salt and sodic carbonate extracts, much less rapidly by the other two ; of the four, the salt extract was far the most rapid in its action. All subsequent experiments have shown that a 5 per cent. solution of sodic chloride is the most efficient in the extraction of the active principle from the seeds.

There is no doubt that the substance which possesses the coagulating power is a ferment closely resembling animal rennet.

I.—A portion of the 5 per cent. sodic chloride extract loses its activity if boiled for a minute or two.

II.—The active principle is soluble in glycerine, and can be extracted from the seeds by this means ; the extract possesses strong coagulating powers even in small amounts.

III.—Alcohol precipitates the ferment body from its solutions ; and the precipitate, after washing with alcohol, may be dissolved up again without having lost its coagulating powers.

IV.—The active principle of the seeds will cause the coagulation of milk when present in very small quantities, the addition of more of the ferment simply increasing the rapidity of the change.

V.—The coagulation is not due to the formation of acid by the ferment. If some of the active extract be made neutral or alkaline, and added to neutral milk, a normal clot is formed, and the reaction of the clot remains neutral or faintly alkaline.

VI. The clot formed by the action of the ferment is a true clot, resembling in appearance and properties that formed by animal rennet, and it is not a mere precipitate.

The question of preparing an extract which should be capable of being kept for a considerable time is perhaps of importance. Ordinary commercial rennet usually contains a large amount of sodic chloride and some alcohol. One specimen I analysed contained 19 per cent. of common salt, and 4 per cent. of alcohol. I have, therefore, added to the 5 per cent. chloride extract mentioned above enough salt to raise the percentage of this to 15 per cent., and also alcohol up to 4 per cent. The activity of the extract is not appreciably altered by this, and such a preparation corresponds very closely in activity with a commercial solution of animal rennet with which I compared it. The possibility of making extracts which may be expected to keep, is thus indicated, but, of course, time alone will show whether the activity of the ferment is impaired to any important extent by such keeping.

I may add, in conclusion, that I have coagulated a considerable volume of milk with an extract such as I have described, and prepared a cheese from the curds. I have also given a portion of the extract to a professional cheese-maker, who has used it as a substitute for animal rennet in the preparation of a cheese. The product thus obtained, and the statements of the person who has made the experiment for me, led me to suppose that extracts of the seeds of Withania can be used as an adequate and successful substitute for animal rennet."

An attempt has been made by Mr. D. S. Kemp, of Bombay, to preserve the ferment by means of sugar, but with only partial success.

PLANTAGINACEÆ.

Plantago ovata.—*Forsk.*, *Bentl. and Trim.*, *t.* 211. The seeds.

Syn.—Plantago Ispaghula.

Vernacular.—Ispaghol (*Hind.*), Isapghol (*Bomb.*), Eshopghol (*Beng.*), Ishappukol-virai (*Tam.*)

History, Uses, &c.—Spogel seeds are not mentioned by the old Hindu writers, nor is there any Indian name for them. In all the vernaculars corruptions of the Persian Ispaghúl are in use. In Mahometan works the seeds will be found described under the name of Bazr-i-Katúna. The author of the Makhzan tells us that Kaliún is the Greek, Isparzah the Isfaháni, and Bangúst and Shikam-daridah the Shirazi names for them.* In India, they are considered to be cooling and demulcent, and useful in inflammatory and bilious derangements of the digestive organs. The crushed seeds made into a poultice with vinegar and oil are applied to rheumatic and gouty swellings. With the mucilage a cooling lotion for the head is made. Two to three dirhems moistened with hot water and mixed with sugar are given in dysentery and irritation of the intestinal canal to procure an easy stool. The decoction is prescribed in cough. The roasted seeds have an astringent effect, and are useful in irritation of the bowels in children and in dysentery. The natives have an idea that the powdered seeds are injurious, and consequently always administer them whole. Fleming, Twining, Ainslie and others speak very favourably of the use of Ispaghúl in the treatment of chronic diarrhœa. Twining gives the dose for an adult as 2½ drachms mixed with half a drachm of sugar-candy. (Diseases of Bengal, Vol. I., p 212.) In the Pharmacopœia of India the seeds have been made official, and directions are given for the preparation of a decoction.

Description.—The seeds are boat-shaped, about $\frac{1}{8}$th of an inch long and rather less than $\frac{1}{16}$th broad, translucent, with a pinkish tinge and a brown streak upon the convex side, the concavity is covered with a thin white membrane; soaked in water they become coated with an abundant adherent mucilage which is free from taste and odour.

Microscopic structure.—The epidermis of the seed is composed of polyhedral cells, the walls of which are thickened by secondary deposits, the source of the mucilage; between it and the albumen is a thin brownish layer. The albumen is formed of thick walled cells which contain granular matter.

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* The common name اسپغول is derived from اسپ a horse, and غول the ear; the leaves are considered to resemble a horse's ear.

Chemical composition.—No thorough investigation has been made. The mucilage does not redden litmus paper, is not altered by iodine or precipitated by borax, alcohol, or perchloride of iron. It is only sparingly soluble in water.

Commerce.—Large quantities of these seeds are imported into Bombay from Persia. Value, Rs. 4 per maund of 37½ lbs. They differ in colour, some being brown and some nearly white with a pinkish tinge; the latter are preferred.

Plantago major, *Linn.*, *Eng. Bot.*, 1558. The seeds.

Vernacular.—Bártang, Bárhang (*Pers.* and *Bomb.*)

History, Uses &c.—The two commonest plantains of English pasture land are described by Dioscorides under the name of Αρνογλωσσον, of which he makes two varieties, the greater and the less, but says that the first is the best and more generally used. These plants were known to the Romans as Plantago. Dioscorides and Galen ascribe valuable medicinal properties to them, and recommend the leaves and root in a number of diseases, as a valuable astringent and febrifuge. Dioscorides says that the seeds taken in wine cure bloody fluxes; he gives ἆσόνθ as the Coptic, and εὐρεχνεύμονος as the Magian name for the Plantain. The Arabs and Persians describe it under the name of Lisan-el-hamal, and state that it is the Kasrat-el-azlaa and Sabaat azlaa of Dioscorides (Arabic translations of ἑπτάπλευρον and πολύνευρον) meaning '*seven ribbed and many ribbed*'; they repeat what the Greeks have written with a few trifling additions. The seeds are largely imported into India from Persia, and have a great reputation as a remedy for dysentery. Valentine Baker tells us that he was cured by these seeds when suffering from the disease during his travels in Khorasan. In England the leaves and root of the Plantain are used as a rustic medicine, but I do not recollect seeing the seeds used medicinally; they are however much in favour as a bird seed.

Description.—These are minute, oblong, brown seeds, marked with waved, slightly elevated, longitudinal ridges of a darker colour; one side is arched, the other concave and marked with a scar showing the attachment to the ovary. They are insipid and have an oily smell when crushed. Soaked in water they become coated with a transparent mucilage.

AMARANTACEÆ.

Achyranthes aspera, *Linn., Rheede Hort. Mal., tt.* 78, 79; *Burm. Zey., t.* 50, *f.* 3. The plant.

Vernacular.—Chirchira (*Hind.*), Apáng (*Beng.*), Ághada (*Bomb.*), Na-yurivi (*Tam.*)

History, Uses, &c.—This plant is called in Sanskrit Apámárga, or the washerman, on account of the large quantity of alkali contained in its ashes, which are used in the preparation of alkaline medicines and caustic pastes. The native physicians also consider it to be astringent, and prescribe it in diarrhœa and menorrhagia, and use it in decoction as a diuretic; they apply the juice of the flowering spike to the bites of venomous reptiles. The spike moreover is supposed to act as a safeguard against scorpions by paralysing them. This superstition appears to prevail in many parts of the country.* In Western India the juice is applied to relieve toothache. The ashes with honey are given to relieve cough; the root in doses of one tolá is given at bed time for night blindness, and rubbed into a paste with water it is used as an *anjan* (eye salve) in opacities of the cornea. European practitioners in India have established its value as a diuretic. (Confer. Phar. of India, p. 184.) The seeds are often used as a famine food in India, especially in Rájputana, where the plant is called Bharotha, भरोटा (grass).

Description.—A common weed, with an erect, striated pubescent stem, generally about two feet high, but sometimes much more. Side branches in pairs, spreading; leaves pubescent from the presence of a thick coat of long simple hairs, obovate, undulated, very obtuse, acuminated, base attenuated ; petiole short ; spikes long, lax ; flowers green ; bracts rigid, prickly. Sections of the stem do not show any crystalline deposit in the parenchyma. The seeds are oblong, of a brown colour, from 1-10th to ⅛ of an inch in length ; on one side a grooved prominence is seen which indicates the position of the embryo where it curves round the mealy albumen. The starch granules are very small, and are so closely packed, that the large irregular shaped cells which contain them have almost the appearance of parenchymatous cells.

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* Compare with Scribonius Comp. 163, 164, where similar superstitions are recorded.

Chemical composition.—The ashes have been found to contain a large quantity of potash.

Commerce.—Ághada is not an article of commerce in Western India.

Amarantus spinosus, *Linn.*, *Willd. Amar.* 38, *t.* 4, *f.* 8; *Vern.*—Tanduliya (*Sans.*), Kántemát (*Bomb.*), Kántanatia (*Beng.*), Mulluk-kirai (*Tam.*), possesses mucilaginous properties. The Hindu physicians prescribe the root in combination with other drugs in menorrhagia. It is considered to be a specific for colic. A poultice of the leaves was officinal in the Bengal Pharmacopœia.

The authors of the Pharmacopœia of India regard the plant as a simple emollient and inferior to many others. Quite recently the root has been found to be of great service in the treatment of gonorrhœa and eczema. In gonorrhœa it is said to stop the muco-purulent discharge, and all the concomitant symptoms, such as heat, scalding and general irritation.

Aerua lanata, *Juss.*, *Rheede Hort. Mal. x.*, *t.* 29; *Burm. Zey.*, *t.* 60, *f.* 1; *Vernacular.*—Kápúr-madhura (*Bomb.*), Sirrú púlay-vayr (*Tam.*), Astmabayda (*Sans.*), a very common weed. Ainslie says:—"This root the Vytians reckon amongst their demulcents, and prescribe it accordingly in strangury, in doses of half a teacupful. The Tellingoo name of the plant is Pindieconda; it is the Scherubala of Rheede, and the Achyranthes lanata of Roxburgh." In the Concan it is considered to be diuretic.

Description.—Stems herbaceous, ascending, much branched, round, striated, a little tomentose, ash-coloured; leaves shortly petioled, obovate-obtuse, shortly mucronate, pubescent on both sides, ashy or hoary and glaucous; spikes solitary or in twos or threes, sessile, horizontal, ovate-obtuse, woolly; flowers white, hoary; calyx twice as long as the bracts; sepals one-nerved.

CHENOPODIACEÆ.

Ushnan. Soda Plants.

Genera.—Arthrocnemum, Caroxylon, Salicornia, Salsola, Suæda.

History, Uses, &c.—Sarjikákshára has doubtless been prepared in India, as it is at the present time, from a very early date. In the time of Pliny a mineral alkali appears to have been prepared in Egypt from the ashes of certain plants and to have been known as Natrum, or in Greek νίτρον (Plin. 31, 10), and Strabo, as cited by Beckman, mentions an alkaline water in Armenia used for washing clothes. (Hist. of Invent. iii., p. 233.) The Arabs also were early acquainted with the same substance, which seems to have been sometimes potash, or a mixture of soda and potash in various proportions, and to which they gave the name of القلي El-kali or alkali. The Arabian writers describe Ushnán as good for the mange or scab, and the itch; clearing to the complexion, cleansing, emmenagogue and abortive, and a substance with which clothes and the hands are washed. The author of the Makhzan, speaking of Ushnán, tells us that it is a name applied to several plants, one of which has slender branches instead of leaves, upon which knob-like bodies form (Suæda fruticosa?). This plant is always fresh and juicy, and is a large herb with round woody stems. He then describes the manner in which the plant is burned in a pit in the ground, and the Kali or Barilla extracted from the ashes. After this he mentions another plant with reddish stems and leaves purplish on one side and green on the other (Chenopodium atriplicis?), yeilding a juice which stains black; this plant he says is very common in Sind and Múltan, and is used for staining the black pattern on the Sind pottery. Lastly, he mentions a plant called Khurú-el-'asáfir, (sparrow's dung) with white leaves (Chenopodium album?), and another which is called in Persia Ghásool, and is used for dissolving lac dye, and as a substitute for ink. Dr. Watt, in his "Catalogue of the Economic Products of India," gives the following list of plants which are used in the manufacture of Sajji-khár or Barilla :—

Arthrocnemum indicum, *Moq.*, Coromandel Coast.
Caroxylon fœtidum, *Moq.*, Sind and Punjab.
,, Griffithii, *Moq.*, Punjab.
Salicornia brachiata, *Roxb.*, Sunderbuns and Coromandel.
Sarsola Kali, *Willd.*
Suæda fruticosa, *Forsk.*, Sind and Punjab.
,, indica, *Moq.*, Sunderbuns and Coromandel.
,, nudiflora, *Moq.*, Pondicherry.

In the "Report on Punjab Products" we are told that the plants are cut down during the cold months, dried and burnt in a pit of a hemispherical shape, about 6 feet in circumference and three deep, at the bottom of which one or more inverted earthen pots, having small holes in their bottoms, are sunk. The holes are kept closed at first, but when the alkali begins to run they are cleared to allow it to fill the pots, when cool it forms a porous mass of a greyish-white colour, consisting of carbonate of soda, sulphate of soda, potash and organic matter. In native practice this substance is prescribed like our preparations of the caustic alkalies.

Celosia argentea, *Moq.*, *Rheede Hort. Mal. x.*, *t.* 38 *&* 39. *Vernacular.*— Sarwâli (*Hind. Punj.*), Kúrdú (*Mar.*) An annual, common every where during the rains; it varies much in appearance according to soil or situation. When young and tender it is eaten as a vegetable in the Concans, but is considered heating. The seeds (Tukm-i-sarwali) are small, black and shining; the author of the Muffaridat-i-Násirí states that 180 grains of them with an equal quantity of sugar-candy taken daily in a cup of milk is a most powerful aphrodisiac.

Arthrocnemum indicum, *Moq.*, *Wight Ic.*, *t.* 737.

Vernacular.—Muchúr (*Mar.*) Is common on salt marshes near Bombay, and is pickled and eaten by the natives. It is the samphire mentioned by Fryer in his account of Bombay in 1694.

NYCTAGINACEÆ.

Boerhavia diffusa, *Linn.*, *Rheede Hort. Mal. vii.*, *t.* 56; *Burm. Ind.*, *t.* 1. The root and leaves.

Vernacular.—Sánt (*Hind.*), Svetapunarnabá (*Beng.*), Punanarva (*Bomb.*), Mukhu-rattai (*Tam.*)

History, Uses, &c.—Sanskrit writers under the names of Panarnava and Sothagni, notice the use of the root of this plant as a laxative, diuretic and stomachic in jaundice, strangury, dropsy, and internal inflammations. Dutt informs us that its Sanskrit synonym, Sothagni, means cure for dropsy, and gives original Sanskrit prescriptions for a compound decoction,* oil and electuary. (Hindu Mat. Med., p. 222.) Ainslie mentions the use of the root in powder, in the quantity of a teaspoonful twice daily, as a laxative. In the Pharmacopœia of India its successful use as an expectorant in asthma is noticed, and it is said to act as an emetic when given in large doses. In Goa the herb is esteemed as a diuretic in gonorrhœa. In Bombay the plant is much used as an external application to dropsical swellings.

Description.—A common creeping weed on waste ground and roadsides; stalks numerous, about two feet long, slender, procumbent; leaves cordate-ovate, unequal, opposite, edges waved; flowers small, pink, sessile on the apex of the pedicels, peduncles from the axils and ends of the branches; fruit oblong, dull green, or brownish, viscid, about the size of a caraway, longitudinally 5-grooved, studded all over with glandular hairs; root twisted, often as thick as the finger when fresh, whitish, fleshy, 2 to 3-branched, a foot long or more; taste bitterish, nauseous. A microscopic section shows that the parenchyme is loaded with needle-shaped crystals, otherwise there is nothing peculiar. In Goa the dried herb without the root is met with in the shops. In Bombay the root forms the bulk of the drug; it is supplied by the herbalists, and is not an article of commerce.

Pisonia morindifolia, *Plum., Lam. Ic., t.* 861, so named by Plumier in honour of Piso, a physician of Amsterdam.

Vernacular.—Chinai Sálit (*Bomb.*) The fresh leaves moistened with Eau de Cologne are used to subdue inflammation of an elephantoid nature in the legs and other parts. (S. Arjun.)

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* पुनर्नवाष्टक Punanaváshtaka. Take of Punanavá root, dried, nim bark, leaves of Trichosanthes dioica, dried ginger, root of Picrorhiza Kurroa, Chebulic myrobalans, Tinospora cordifolia, dried wood of Berberis (Darhalad), of each one quarter tolá, water 32 tolás, boil down to one-fourth. To be taken daily.

The tree is a native of the Eastern Islands; the leaves have the remarkable peculiarity of becoming darker in the shade, and bleaching when exposed to strong sunlight.

Mirabilis Jalapa, *Linn., Rheede Hort. Mal. x., t.* 75; *Bot. Mag., t.* 371.

Vernacular.—Gul Abbás. The juice of the leaves is applied to wounds and bruises; boiled in water they are used as a stimulating poultice to boils and buboes. This plant is the well-known 'Marvel of Peru,' and is common in every garden; the roots possess purgative properties; the seeds are used to adulterate black pepper. This plant is the Krishnakeli of Sanskrit writers. In the Concan the dried root powdered, and fried in ghí with spices, is given with milk as a *Paushtik* or strengthening medicine, and rubbed with water it is applied as a *lép* in Rakta-bao (contusions).

POLYGONACEÆ.

Emex sp. ? The herb.

Vernacular.—Shukai (*Hind.* and *Bomb.*)

History, Uses, &c.—This drug is described in Mahometan works as the Akraníkí* or Afsharníkí of the Greeks. Other Arabic names given are Shaukat-el-baida, Shaukat-el-Arabiya, and Kathir-el-rakab. The Latin name is said to be Atrákiás.† Ibn Sina says it is the same as Bázaward (Bádaward, *Pers.*) Muhammad Husain very truly denies this, but admits that it is somewhat like it; he says the Persian names are Charchah and Kangarkhár, and describes two varieties; one with a white flower and more slender stems than the other, which has purple flowers, and is the kind generally used. The latter, he says, has triangular stems the size of a man's finger or less, and thick small triangular downy leaves terminating in thorns; the seeds are small, triangular, and of a greyish colour. The whole drug is of a yellowish white colour, and sweetish taste. The root and fruit are generally used, but the root is to be preferred. Shukai is more drying and astringent than Bádaward; it is attenuant and deobstruent, &c., &c., (Makhzan-el-Adwiya, article "Shukai.")

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* Possibly from *ἀκρώνυχος* on account of its thick leaves, each lobe of which terminates in a thorn.

† A thistle-plant called *ατρακτυλίς* is mentioned by Greek writers, and also by Pliny 21, 15.

Description.—The drug as met with in Bombay consists of all parts of the plant broken up, but very little of the root is present. The portions of the stem are of a greenish yellow colour, round, crooked, channelled, with numerous branches springing from the axils of the leaves, the external surface of the stem is siliceous, hard, and pubescent, internally it is full of soft pith. The petioles of the leaves are stem-clasping, the lower ones completely so. The lower leaves are of considerable size with a triangular midrib, channelled on the upper surface, and short, thick, spinous lobes, which vary much in shape. The plant has a gummy, rather disagreeable taste. The fruit is occasionally found mixed with the drug in considerable quantity. It is a woody nut, ¼ of an inch long, formed by the fusing together of the different parts of the perianth and ovary, somewhat triangular in form; at the base are spines formed by the calycine segments; at the apex the perianth forms a number of tooth-like processes, which surround the top of the ovary. The seed is ovoid, horny, and has a terebinthinate odour.

Commerce—Value, Rs. 7 per maund of 37½ lbs.

Rumex* vesicarius, *Linn.*, *Moris. Hist.*, *s.* 5, *t.* 28, *f.* 7, Chúka (*Hind.*, *Beng.* and *Bomb.*), Chúkra (*Sans.*), is cultivated all over Asia, and is used just as sorrel is in Europe, excellent

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* Several species of Rumex were used by the Greeks under the name of λαπαθον (Dios. ii., 106,) and are still known to moderns as λαπαθο.

'potage à l'oseille,' may be made with it. The plant is doubtless one of the kinds of Hamáz mentioned in Arabic works, and is much esteemed for its medicinal properties. The juice is said to allay the pain of toothache, and by its astringent properties to check nausea, promote the appetite, and allay morbid craving for unwholesome substances. The herb also is considered very cooling and of use in heat of stomach, and externally as an epithem to allay pain, especially that caused by the bites or stings of reptiles and insects. The seeds are said to have similar properties, and are prescribed roasted in dysentery, and as an antidote to scorpion stings. The root is also medicinal.

Description.—The fruit sold in the shops as Gulhamáz is reddish-brown, about $\frac{1}{10}$th an inch long, and consists of three fringed, leaf-like expansions, each furnished with an oblong glandular body and attached at the base to a short thick pedicel; they enclose a triangular, polished, dark-brown seed.

Polygonum glabrum, *Willd., Rheede Hort. Mal. x., t.* 80, *and xii., t.* 77; *Wight Ic.,* 1799, Rakta-rohida (*Bomb.*), Aatalaria (*Tam.*), is found growing in ditches and other wet places. An infusion of the leaves is used by the country people to relieve pain in colic. It is a sub-erect, smooth, reddish annual; leaves narrow, lanceolate, short-petioled, tapering to each end, smooth on both sides, entire, 5 to 7 inches long; stipules ragged; racemes of flowers long, slender and smooth; flowers numerous, rose-coloured, heptandrous; style 3-cleft; seed ovate, compressed. (*Bomb. Flora,* p. 214.)

P. aviculare, *Linn., Eng. Bot.,* 1252, Miromati (*Sans.*), Machoti (*Hind.*), is medicinal in the Behars. It is the male πολύγονον of Dioscorides, a vulnerary and astringent herb, in English *Knot-grass,* used to stop bleeding from the nose, &c. (Conf. Scrib. Larg. Comp. 46, 83.)

Rheum sp. ? Local name, Lakri-rewand-chini. This is a very inferior kind of rhubarb in long stick-like pieces, which arrives at Bombay from the Eastern ports. It comes from China, and has hardly any aroma, a bitterish taste, and but slight purgative action. When fresh it is covered with a yellow dust like ordinary rhubarb. The natives use it as a tonic and stomachic. None of the commercial rhubarb known as East Indian is imported into Bombay unless specially ordered from China, but it often passes through the port on board the P. and O. Company's steamers. Bombay druggists, native and European, obtain their rhubarb from London. On account of its low price the former always import English rhubarb. The Lakri-rewand-chini fetches Rs. 3-12 per maund of 37½ lbs. It is known in European commerce as *Canton Stick Rhubarb.*

The Persian name for Rhubarb, which is a common plant in Gilán, is Riwás (the plant Ri), a remnant of the Zend language; the Arabs write it Ribás.

The following analysis by Elborne shows that English grown Rhubarb, as far as chemical constitution goes, compares not unfavourably with the Eastern drug :—

	R. officinale ordinary cultivation.	R. officinale high cultivation.	R. rhaponticum.	East Indian Rhubarb.	Russian Rhubarb.
	P. c.	P. c.	P. c.	P. c.	P. c.
Moisture	6·06	7·9	5·57	5·4	12·6
Ash	9·33	4·9	7·9	9·28	6·63
Mucilage (soluble in water)	6·5	4·8	4·1	4·0	5·5
Cathartic acid	3·5	3·2	3·3	4·5	3·2
Tannin & chrysophan	14·3	11·7	12·5	11·7	11·0
Organic acids	3·3	2·2	1·5	3·0	4·5
Resinous substances soluble in alcohol	2·6	2·0	3·4	4·6	5·2
Fat and free chrysophanic acid soluble in petroleum ether	0·4	0·3	0·2	0·7	1·5

Bijband. Shining angular seeds (nuts), evidently derived from a species of Rumex. They are used as an aphrodisiac. Murray states that the fruit of Polygonum aviculare, *Linn.*, is known as Bijband or Endraní in Sind. According to Atkinson, Rumex Wallichii, *Meisn.*, yields the Bíjband of the bazars.

MYRISTICEÆ.

Myristica moschata, *Willd.*, *Bentl. and Trim.*, 218. The seed and arillus.

Vernacular.—The seed, Jaephal (*Hind.*), Jaiphal (*Bomb.*), Jádikkay (*Tam.*), Játi (*Beng.*); the arillus, Jawitrí (*Hind.*), Jadipattiri (*Tam.*), Jawantrí, Jápatrí (*Bomb.*)

History, Uses, &c.—It appears to be uncertain when nutmegs were first known in India. The later Sanskrit writers mention them under the name of Jatiphala. Early Arabian travellers in India also notice them as articles of commerce, and later Mahometan writers inform us that Jouz-bawwa (nutmegs) come from Java, one of the Zerbad islands, the port of which is Batavia. Mír Muhummad Husain says that the Dutch keep the trade in their own hands, but that he has heard that the tree is now cultivated in Sounda in Southern India. Whether he was rightly informed with regard to Sounda I am unable to say. But that his information was substantially correct there can be no doubt, as Ainslie tells us that in his time the true nutmeg tree was growing in the Tinnevelly district, and produced pretty good fruit. The tree has also been introduced into Ceylon and Zanzibar, and appears to flourish in the warm moist climates of those islands. Both nutmegs and mace are favourite medicines of the Hindus, who prescribe them as a stimulant in low fevers and lung and bowel complaints. In large doses they consider them to be intoxicating. The Mahometan doctors describe nutmegs and mace (Basbásah) as stimulating, intoxicating, digestive, tonic, and aphrodisiac, useful in choleraic diarrhœa, especially when roasted; also in obstructions of the liver and spleen. A paste made with nutmegs is used as an external application in nervous headache, palsy, &c., applied round the eyes it is thought to strengthen the sight. The expressed oil of nutmegs is imported into India from Banda, and is known as Jawitrí-ka-tel (oil of mace).

Description.—The following excellent description of the nutmeg fruit is taken from the Pharmacographia:—"The fruit of Myristica fragrans is a pendulous, globose drupe, about 2 inches in diameter, and not unlike a small round pear. It is marked by a furrow which passes round it, and by which at maturity its thick fleshy pericarp spilts into two pieces, exhibiting in its interior a single seed, enveloped in a fleshy foliaceous mantle or arillus, of fine crimson hue, which is mace. The dark brown, shining ovate seed is marked with impressions corresponding to the lobes of the arillus; and on one side, which is of paler hue and slightly flattened, a line indicating the raphe may be observed.

The bony testa does not find its way into European commerce, the so-called nutmeg being merely the kernel or nucleus of the seed. Nutmegs exhibit nearly the form of their outer shell with a corresponding diminution in size. The London dealers esteem them in proportion to their size, the largest, which are about one inch long by $\frac{8}{10}$ of an inch broad, and four of which will weigh an ounce, fetching the highest price. If not dressed with lime, they are of a greyish brown, smooth yet coarsely furrowed and veined longitudinally, marked on the flatter side with a shallow groove. A transverse section shows that the inner seed coat (endopleura) penetrates into the albumen in long, narrow brown strips, reaching the centre of the seed, thereby imparting the peculiar marbled appearance familiar in a cut nutmeg. At the base of the albumen and close to the hilum, is the embryo, formed of a short radicle with cup-shaped cotyledons, whose slit and curled edges penetrate into the albumen. The tissue of the seed can be cut with equal facility in any direction. It is extremely oily, and has a delicious aromatic fragrance, with a spicy rather acrid taste.

Microscopic structure.—The brown covering of the nutmeg is formed by the endopleura, which also dips in and forms numerous processes which divide the albumen in every direction; it is composed of soft-walled brown cells, which on the external surface are small and flat, but much larger in the processes already mentioned. The cell structure of the albumen is loaded with starch and fatty matter, some of which is crystalline.

Chemical composition.—Nutmegs contain starch, albumen, fat and essential oil. The fat constitutes one-fourth of their weight, and the essential oil three to eight per cent. The latter is a hydrocarbon, $C^{10} H^{16}$, and boils at 165° C.

Commerce.—Value, Re 1-4-0 to Re 1-8-0 per lb. The nutmegs imported into Bombay run from 100 to 130 to the pound; the larger seeds never make their appearance in this market.

Myristica malabarica, *Lamk.*, *Rheede Hort. Mal. iv., t.* 5. The seed and arillus.

Vernacular.—The seed, Jangli Jaiphal, Kaiphal (*Bomb.*); the arillus, Rámpatri (*Bomb.*)

History, Uses, &c.—This drug does not appear to have been known to the older Hindu and Mahometan medical writers, but the following extract from the Makhzan-el-Adwiya seems to apply to it. Speaking of true nutmegs, the author says:—"Latterly the English have discovered a kind of nutmeg in Southern India, which is longer than the true nutmeg and softer, but is much inferior to it in oiliness, odour, and medicinal properties." (Confer. Makhzan, article "Jouz-bawa.") It is the *Panam-palca* of Rheede (Hort. Mal. IV., t. 5), who says that the Turkish and Jewish merchants use the nutmegs for adulteration. According to the editor of the Pharmacopœia of India, the seed is used medicinally in the Madras Presidency; it yields when bruised and subjected to boiling a considerable quantity of concrete oil, analogous to expressed oil of nutmeg, which is said to be an efficacious application to indolent ulcers, allaying pain and establishing healthy action. An ointment may be made by melting it with sweet oil. The seeds are used for similar purposes in Bombay in the form of a *lép*, and the oil is also extracted. Recently the arillus, under the name of 'Bombay mace,' has made its appearance in the European markets, probably for the purpose of adulterating true mace. (Confer. A. Tschirch in Pharmaceut. Zeitung, 1881, No. 74.) In Bombay it is used as a spice.

Description.—M. malabarica bears an oblong, tawny, hairy fruit, 2½ to 3 inches long, with a lucumose arillus, the lobes of which are twisted and folded into a cone at the top, and are longer and thinner than those of true mace. The arillus is of a dark brown-red colour, and on the inside has adhering to it a thin papery membrane of a light brown-colour. The shell is hard and brittle, and contains an elongated kernel, resembling a nutmeg, and from 1¼ to 2 inches long; when cut in two it is seen to have the same ruminated structure, but the odour is fruity, with hardly any aroma. Similarly, the mace is deficient in odour and flavour.

Microscopic structure.—The epidermal cells of the arillus are radially elongated, narrow, and twice as high as those of true mace, which are tangentially elongated; their walls show the cellulose reaction with iodine and sulphuric acid, and with chloride of zinc and iodine swell and turn faintly blue. The oil cells are very numerous, located near the epidermis on both sides, often close together in groups of two or three, oval in shape, somewhat radially elongated, and contain a dark-yellow usually resinified oil, frequently also a brownish resin. (A. Tschirch.) The external covering of the seed is formed by the compressed cells of the endopleura, and is thicker than that of the true nutmeg; the processes which penetrate the albumen are composed of very large cells loaded with a viscid reddish-brown substance, which has an astringent and somewhat acid taste. The albumen is composed of large cells loaded with starch, some of the cells and their contents are of a reddish-brown colour. There is no crystalline fat visible.

Commerce.—Rámpatri is now worth about Rs. 10 per maund of 37½ lbs.; formerly it was much cheaper. The nutmegs fetch Rs. 2 per maund of 37½ lbs.

LAURINEÆ.

Cinnamomum Camphora, *Nees, Bentl. and Trim., t.* 222. Camphor.

Vernacular.—Káfúr (*Hind.*), Karuppuram (*Tam.*), Kápúr (*Bomb.*), Karpur (*Beng.*)

History, Uses, &c.—As has been already mentioned (see article Dryobalanops), Sanskrit writers under the name of Karpura speak of two kinds of camphor, Pakva and Apakva. It is generally supposed that the former term, which means prepared by the aid of heat, refers to ordinary commercial camphor obtained from the wood of C. Camphora. The researches of Flückiger and Hanbury show that the only camphor known in early times was that found in the trunk of Dryobalanops aromatica. Early Chinese writers only speak of C. Camphora as producing a valuable wood, and we have no information as to the date of the first extraction of camphor from it. Garcia d'Orta, who wrote at Goa about the middle of the 16th century, was well acquainted with both kinds of camphor. He tells us that the China camphor is the only kind exported to Europe. The medicinal uses to which camphor is put in the East have been already noticed under Dryobalanops. With the exception of a small quantity of refined camphor imported from Japan, the bulk of the drug used in India is imported in the raw state and resublimed in the country. The process of resublimation is a peculiar one, the object being to get as much interstitial water as possible into the camphor cake. The vessel used is a tinned cylindrical copper drum, one end of which is removable; into this is put 14 parts of crude camphor and 2½ parts of water, the cover is then luted with clay, and the drum being placed upon a small furnace made of clay is also luted to the top of the furnace. In Bombay four of these furnaces are built together, so that the tops form a square platform. The sublimation is completed in about three hours; during the process the drums are constantly irrigated with cold water. Upon opening them a thin cake of camphor is found lining the sides and top, it is at once removed and thrown into cold water. Camphor sublimed in this way is not stored, but distributed at once to the shopkeepers before it has time to lose weight by drying. It is sold at the same price as the crude article, the refiner's profit being derived from the introduction of the water. Both China and Japan crude camphor is imported into Bombay, but the latter is preferred as it is cleaner. From Japan is also imported refined camphor in large square cakes an inch and a half thick, with a hole in the centre ; it is nearly equal in quality to that refined in Europe. The method of obtaining crude camphor in Japan will be found fully described by H. Oishi in the Journ. Soc. Chem. Ind., 1884, p. 353.

Description.—Crude China camphor is in small dirty white or brown grains, more or less moist from the presence of water; it arrives in tin-lined boxes which hold one quintal. Crude Japan camphor is also in grains, which often adhere together in masses ; it is dry and often quite free from discolouration, sometimes it has a pinkish tinge. It is imported in double butts.

Refined Japan camphor is imported in tin-lined cases, which hold about 90 lbs. Bombay refined camphor is in porous cakes, a quarter of an inch thick, and contains much water. Owing to the method of preparation already described the cakes have no particular form.

Chemical composition.—For a full account of the chemistry of camphor the reader is referred to Wurtz's Dictionnaire de Chimie, and other standard works.

Commerce.—The importations of crude camphor into Bombay in 1881-82 amounted to 323,799 lbs.

Value, China and Japan crude camphor, Rs. 15 to Rs. 16 per Surat maund of 37½ lbs. ; Japan refined, Rs. 30.

Cinnamomum Cassia, *Blume, Bentl. and Trim., t.* 223. The bark and buds.

Vernacular.—Dárchíní, Taj (*Hind.*), Dálchíní, Taj (*Beng.* and *Bomb.*), Lavangap-pattai (*Tam.*)

History, Uses, &c.—Cassia is mentioned in the earliest Chinese herbal, said to have been written 2700 B.C., also in the ancient Chinese classics; it was well known to the Greeks and Romans* as *κασία*, Casia. The older Hindu physicians were probably acquainted with a similar substance obtained from some of the species of Cinnamomum growing in India. From the researches of Flückiger and Hanbury, it would appear that cassia (Chinese or Indian), must have been the Cinnamon first known in Western countries. The sacred books and old records of Ceylon make no mention of Cinnamon, and when the bark first began to be collected in that island is unknown. Kazwini, in the 13th century, is the first writer who mentions Ceylon Cinnamon. The Arabians, through whose hands most of the Cinnamon of the ancients reached Europe, called the spice Kirfat-ed-dársíní (bark of Chinese wood), or more shortly Kirfah (the bark *par excellence*), and it is curious to observe that the same word in the corrupted form of Kalfah is at the present time the commercial name of Malabar Cassia in Bombay. The more recent Mahometan writers on Materia Medica are evidently well acquainted with the difference between Ceylon Cinnamon and that produced in India. The author of the Makhzan remarks:—"From Ceylon to the Dekhan the quality of the Cinnamon grown gradually deteriorates, the bark getting thick and mucilaginous."

Cassia and cassia oil imported from China are used medicinally in India in much the same manner as they are in Europe. No Ceylon cinnamon comes to Bombay. Kalfah or Malabar cassia is also largely used as a substitute for the Chinese article.

Description.—Chinese cassia arrives in Bombay packed in boxes, which are covered with matting. Each box contains about 60 lbs. The bark is tied up in bundles which weigh about 1 lb. each, with strips of bamboo. The greater portion of each bundle consists of single quills of a light brown colour, with here and there portions of the external bark still attached; in the centre of the bundle is a small collection of fragments of bark and rubbish. Cassia bark is thicker than true cinnamon, but has a similar taste and odour. Kalfah, or Malabar cassia, also called Taj, the bark of C. iners, occurs in flat or slightly quilled pieces, much thicker than the Chinese bark and of a deeper colour. If of good quality it has a strong cinnamon odour and taste, but is deficient in sweetness. It is brought to market tied up in bundles like China cassia. Inferior qualities have very little odour and taste, and are only partially decorticated. The Chinese oil is imported in tins, which contain 12½ catties each.

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* Conf. Dios. i., 12 and 13; Pliny 12, 19; Herodt. 2, 86 and 3, 110.

Microscopic structure.—Externally the bark is furnished with a suberous layer. Within this is a parenchymatous portion in which may be seen an irregular zone of stony cells. The remainder is mostly composed of liber, in which are situated numerous large cells which contain the essential oil. Laticiferous vessels containing a gummy substance are also present in the parenchyme.

Chemical composition.—Flückiger and Hanbury in their Pharmacographia have the following account of the chemistry of Cassia:—"Cassia bark owes its aromatic properties to an essential oil, large quantities of which are shipped from Canton. In a chemical point of view, no difference can be pointed out between this oil and that of Ceylon cinnamon. The flavour of cassia oil is somewhat less agreeable, and as it exists in the less valuable sorts of cassia, decidedly different in aroma from that of cinnamon. We find the sp. gr. of a Chinese cassia oil to be 1·066, and its rotatory power in a column 50 mm. long, only 0·1° to the right, differing consequently in this respect from that of cinnamon oil.

Oil of cassia sometimes deposits a stearoptene, which when purified is a colourless, inodorous substance, crystallizing in shining brittle prisms. We have never met with it.

If thin sections of cassia bark are moistened with a dilute solution of perchloride of iron, the contents of the parenchymatous part of the whole tissue assume a dingy brown colour; in the outer layers the starch granules even are coloured. Tannic matter is consequently one of the chief constituents of the bark; the very cell-walls are also imbued with it. A decoction of the bark is turned blackish green by a per salt of iron.

If cassica bark (or Ceylon cinnamon) is exhausted by cold water, the clear liquid becomes turbid on addition of iodine, the same occurs if a concentrated solution of iodide of potassium is added. An abundant precipitate is produced by addition of iodine dissolved in the potassium salt. The colour of iodine then disappears. There is consequently a substance present, which unites with iodine; and, in fact, if to a decoction of cassia or cinnamon, the said solution of iodine is added, it strikes a bright blue colouration, due to starch. But the colour quickly disappears, and becomes permanent only after much of the test has been added. We have not ascertained the nature of the substance that thus modifies the action of iodine; it can hardly be tannic matter, as we have found the reaction to be the same when we used the bark that had been previously repeatedly treated with spirit of wine and then several times with boiling ether.

The mucilage contained in the gum-cells of the thinner quills of cassia is easily dissolved by cold water, and may be precipitated together with tannin, by neutral acetate of lead, but not by alcohol. In the thicker barks it appears less soluble, merely swelling into a slimy jelly.

Commerce.—Chinese cassia fetches in Bombay from 3½ to 4 annas per lb.; Malabar cassia about Rs. 5 for 37½ lbs. Chinese oil, Rs. 2 as. 6 per catty. Imports in 1880-81, 16,092 cwts.

Kálá Nágkesar.—Under this name the immature fruit of Cinnamomum Cassia, *Blume,* and C. iners, *Reinw.*, is imported into Bombay from China and Southern India.

Kálá (black) Nágkesar (known in Europe as Cassia buds), consists of a small brown mucronate berry, the size of a grain of millet, enclosed in a 6-partite calyx half an inch long, which is articulated to a slender pedicel; the calyx and pedicel are of the dark brown colour of the clove, and have a strong cinnamon odour and taste. The properties of the spice would appear to be the same as those of cinnamon. Two kinds are found in the Bombay market, Chinese and Malabar; they are used as a spice by the Mahometans. For an account of the use of the Chinese buds as a spice in Europe from the 14th century up to the present time, see Pharmacographia, 2nd Ed., p. 533. Hamburg in 1876 imported 1,324 cwts. (*Op. cit.*)

Tejpát or Tajpát.—Under this name the leaves of a species of cinnamon, generally supposed to be the C. Tamala, *Nees,* are sold by all the Indian druggists. These leaves are said to be the *Folia Malabathri* of the ancients, described by Dioscorides and Pliny.* They are the Tejpatra of Sanskrit writers and the Sázaj-i-Hindi of the Indian Mahometans, and are much used both as a condiment and medicine in India. The author of the Makhzan describes them as yellowish, coriacious, ovate-lanceolate leaves, with five nerves extending from the base to the apex, and says that they are produced by a large tree growing in the mountains of Sylhet, the bark of which is used as cassia. Tejpát is considered to be carminative, stimulant, diuretic, diaphoretic, lactagogue and deobstruent.

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* If the fabulous description of *μαλαβάθρον* by Dioscorides (i., 11,) is correct, the leaves cannot have been those of a cinnamon. The Arabians repeat what Dioscorides says, and throw no light upon the subject. The Persian Burhán says that the leaves are like those of the walnut, green on one side, and yellowish on the other; when placed with clothes they protect them from moth.

Description.—The leaves vary a good deal in size, the largest are 6 inches long or more, and 1½ inch broad, oblong, obtuse-pointed, entire with three principal nerves and two smaller ones which are sometimes quite marginal; the venation between these nerves, which run from base to apex of the leaf, is finely reticulated. The leaves are of an olive green colour, the upper surface is polished. They have a pleasant odour like a mixture of cloves and cinnamon. Value, Re. 1¼ per 37½ lbs.

Actinodaphne lanceolata, *Dalz. Vernacular.*—Pisa. A cold infusion of the leaves is mucilaginous, and is used in urinary disorders and in diabetes. The oil of the seeds, Pisa-tela, is used as an external application to sprains; it is of a reddish colour, and has a fatty odour.

Tetranthera laurifolia, *Jacq., Hort. Schoenb. i., p.* 59, *t.* 113. The bark.

Vernacular.—Maida-lakrí (*Hind., Beng.* and *Bomb.*), Maida-laktí (*Tam.*)

History, Uses, &c.—I have been unable to trace the history of the use of this bark as a medicine. It is one of the best known and most popular of native drugs, being used internally, on account of its demulcent properties, in diarrhœa and dysentery, and externally as an emollient application to bruises, &c. Maida-lakrí would appear not to have been mentioned by Sanskrit writers. In Mahometan works it is briefly noticed under the names of Maghath-i-Hindí and Kilz. The author of the Makhzan-el-Adwiya states that it has the same essential properties as Maghath. It would appear then to have been adopted by Mahometan physicians in India as a substitute for an Arabian drug called Maghath, the botanical source of which is uncertain.

Description.—The bark varies in thickness from $\frac{1}{10}$th to $\frac{3}{10}$ths of an inch; externally it has several layers of whitish, scabrous, corky tissue, the remaining portion is of a chocolate brown colour. The odour is feebly balsamic; when placed in water it affords a large quantity of bland mucilage, having a faint agreeable aroma. If the bark is old the aroma disappears, but the mucilaginous qualities remain unimpaired.

Microscopic structure.—The parenchyma, which is chiefly composed of mucilage cells, contains abundance of reddish-brown colouring matter. There is a zone of stony cells, but no distinctive characteristics.

Commerce.—Maida-lakrí comes to Bombay through Nagpore. Value, Rs. 6 per maund of 41 pounds.

At Goa, under the name of Mirio, a bark which in appearance, minute structure and properties, closely resembles Maida-lakrí, is made use of as a demulcent. It is the produce of a tree which appears to me to be the Tetranthera apetala of Roxburgh. The leaves, *Vern.*—Chickana, are mucilaginous, and have a pleasant odour of cinnamon, but the bark is odourless.

Laurus nobilis, *Linn.*, *Zorn Ic.*, 52; *Bentl. and Trim.*, *t.* 221. Bay berries, under the name of Hab-el-ghár, are sold in the Bombay shops. They are imported from Egypt. (Conf. Dios. περὶ δαφνης, i., 91.)

Cassytha filiformis, *Mill.*, *Rheede Hort. Mal. vii.*, *t.* 44; *Vern.*—Akáswel (*Bomb.*), Amarbeli (*Hind.*), Akásavalli (*Sans.*), is a common parasite on bushes; it consists of a tangled mass of tough dark-green stems, branched, marked longitudinally with delicate pale green lines, the largest are the size of a crow-quill; the branches are provided with small round suckers, like those of the common dodder. Sections of the stem show a strong fibro-vascular layer and loose central pith. The fruit is globular, of the size of a pea, and surmounted by the remains of the sepals ; on removing the outer envelope, which is tough, an inner envelope is exposed, which consists of two layers, the outer cartilaginous, the inner fleshy and lined with white hairs, each containing a delicate spiral filament; within this central cavity is a third delicate membranous envelope covered with hairs, of a similar description and containing the ovule. Akáswel is used in native practice as an alterative in bilious affections and for piles.

THYMELÆACEÆ.

Mazariyun.—The Mezereon of Mahometan physicians is described in their works upon Materia Medica as a leaf.* Mír Muhammad Husain says there are three kinds, *viz.*, white with large thin leaves, called Ashkhís, yellow with yellowish thick leaves, smaller than those of the olive, called in Persian Haft-barg and Musht-rá, and black with black leaves! The white is to be preferred as the least acrid; but even the leaves of this kind require to be soaked for 48 hours in vinegar, which should be several times changed, to make them fit for medicinal use. Having been thus prepared, they are to be washed and dried, and pounded with almond oil. This preparation may then be given in combination with purgatives, bitters and aromatics, in dropsy or in such cases as are benefited by hydrogogue and drastic cathartics, to the extent of 24 grains.

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* The Mezereon of the Arabian writers is considered by C. Bauhin to be the Cneorum tricoccon. It is probably the same as the Chamælea of Scribonius, of which he says: "Purgat belle chamælea, quæ herba olivæ folia similia habet: quorum quinque vel sex dare oportet." (Comp. 136.) Apuleius Platonicus has the following synonyms for it. He says: "Alii pyros agnen, alii heracleon, alii bdelyram, alii coccon gnidion, Romani citocacium, nonnulli oleaginem, quídam oleastellum vocant." (De Vir. Herb., 26.)

Mulla Ahmad Nabti, in his Tarikh-el-hukama, tells a story of a dropsical patient, who was cured by eating locusts which had been feeding upon Mezereon leaves; they acted as a hydrogogue cathartic.

Lasiosiphon speciosus, *Dcne. in Jacq. Voy., p.* 147, *t.* 150. *Vernacular.*—Rametha. The bark is a powerful vesicant. A shrub with leaves like the willow; heads of flowers terminal, surrounded by an involucre of oblong, rather hoary leaflets; calyx hairy, the lobes ovate obtuse, with five linear bifid scales half their length. Common on the higher Ghauts. Dr. J. Y. Smith, in his "Matheran Hill, its People, Plants and Animals," (p. 35), says "the Rametha bushes are often seen stripped of their bark, which is used for poisoning fish."

The bark consists of an outer suberous portion which is of a light brown colour and divided by numerous transverse and longitudinal fissures, so that it can be easily separated, and of an inner layer which is white, tough and silky like Mezereon. The wood cells are easily separated and form pretty microscopic objects, as they are beautifully transparent. The taste is acrid.

Aquilaria Agallocha, *Roxb., Royle Ill., t.* 36, *f.* 1. Lign-aloes.

Vernacular.—Úd (*Arab.*), Agar (*Hind.* and *Bomb.*), Ag'ru (*Tel.*), Agar (*Beng.*)

History, Uses, &c.—Three different plants have for a long time been supposed to yield Aloes wood, but as far as we can ascertain one only, the A. Agallocha, is, with certainty, known to do so. The two others are the Aloexylon Agallochum, Leguminosæ, and the Excæcaria Agallochum, Euphorbiaceæ. Roxburgh and other botanists have examined the Aquilaria in Sylhet, and recently it has been ascertained to be the tree which produces Aloes wood in the islands of the Mergui Archipelago. Gamble says that "Akyan (the Burmese name for Agallocha) is the most important produce of the forests of South Tenasserim and the Mergui Archipelago. It is found in fragments of various shapes and sizes in the centre of the tree, and usually, if not always, where some former injury has been received." An inquiry into the history of Aloes wood shows that an odoriferous wood bearing the name of Ahalot was known to the ancient Jews; the same substance appears to have been called agallochon by the Greeks.* The early Arabs corrupted this term into Aghalúkhí, but subsequently adopted the terms Úd, meaning wood, and Úd Hindí (Indian wood), as the technical names for Aloes wood. In Sanskrit it is called Aguru, from which is derived the modern Hindí name Agar. Upon the subject of Úd, Mír Muhammad Husein has the following remarks:—"Úd, in Hindí Agar, is the wood of a tree which grows in the Jantiya hills near Sylhet, a dependency of the Súbah of Bengal, situated towards the north-east of Bengal Proper. The tree is also found in the islands to the south of Bengal, situated north of the Equator, and in the Chatian islands belonging to the town of Nawaka, near the boundaries of China. The tree is very large, the stem and branches generally crooked, the wood soft. From the wood are manufactured walking sticks, cups, and other vessels; it is liable to decay, and the diseased part then becomes infiltrated with an odoriferous secretion. In order to expedite this change it is often buried in wet ground. Parts which have undergone the change abovementioned become oily, heavy, and black. They are cut out and tested by being thrown into water; those which sink are called Gharki, those which partly sink Ním Gharki, or Samáleh-i-aala, and those which float Samáleh; the last kind is much the most common. Gharki is of a black colour, and the other qualities dark and light brown. According to other and older authorities, Úd is classified as Hindí, Samandúrí, Kamárí and Samandalí. Hindí is described as black, Samandúrí as more oily than Hindí, Kamárí as pale-coloured, Samandalí as very odoriferous. Elsewhere it is described as Barrí and Jabali, the latter having black lines in it, the former white; others again described Barrí as having black lines, and Jabali white.

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* Dios. i., 21, *αγάλλοχον ξύλον ἐστί φερομενον ἐκ της ἰνδίας και ἀραβίας*, later Greek writers call it *ξυλαλόη*.

" Samandúrí Úd is said to be called after the place whence it is obtained, also Kamárí.

" The best kind for medicinal use is Gharki Úd from Sylhet, it should be bitter, odoriferous, oily and a little astringent; other kinds are considered inferior. In most receipts raw Úd (Úd-i-khâm) is enjoined to be used to prevent the use of wood from which the oil has been abstracted by crushing and maceration in water, or by crushing and admixture with almonds, which are afterwards expressed. This precaution is the more necessary as Úd shavings are an article of commerce in India under the name of Chúra agar; they are often adulterated with chips of Sandalwood, or Taggar, an odoriferous wood much like Aloes and common in India. I have also heard mention made of the kind of Úd which is described by the author of the Ikhtiárát-i-badiae as coming from Bunder Chíta, ten days' sail from Java, and esteemed equal in value to its weight of gold; this kind is said to have no smell until warmed. When taken in the hand it diffuses a delightful odour (possibly Bunder Chíta has been written in mistake for Chatian). There is another kind of wood common in India, which resembles Aloes in appearance, consistence, and oiliness; it is called Taggar, and is often sold for Úd." (Makhzan, article "Úd.")

Rumphius, Kœmpfer and others have written at some length on Aloes wood, but have not thrown much light upon the subject. (Confer. Guibourt Hist. Nat., Tom. III., p. 336.) Guibourt describes five kinds of Aloes wood, from the examination of specimens which he has met with in Europe. The first, a specimen in the École de Pharmacie, he attributes to Alœxylon Agallochum; the second, which he considers to be the produce of an Aquillaria, is the ordinary Aloes wood of European commerce. The fifth, which is very heavy, oily, and resinous he thinks must be produced by Excæcaria Agallocha; in this wood there are cavities filled with a reddish resin. Guibourt's first and second kinds are more minutely described by Planchon. The varieties of Agar found in the Bombay market are three; Siam or Mawardhí, Singapore, and Gágulí. Besides these we have Taggar from Zanzibar and a false Aloes wood. In native practice Agar is used as a deobstruent, stimulant, carminative, and tonic; it is said to relieve the pain in gout, and to check vomiting. Susruta directs Aguru, Guggula,* Sarjarasa,† Vacha;‡ white mustard, Nim leaves and salt to be made into a paste with ghí to form an anodyne fumigation for surgical wounds called in Sanskrit *Vedanárakshoghnairdhupaih.*

Description.—The wood occurs in irregular pieces, which vary in colour from grey to dark brown according to the amount of resin which they contain; both light-coloured and dark pieces are marked with longitudinal veins of a darker colour. The best pieces show numerous cavities and sinuses produced by the cutting away of wood less impregnated with resin; they sink in water. When a portion is chewed it softens between the teeth; the taste is bitter and aromatic; when burnt it diffuses an agreeable odour, whilst the false aloes has an odour like burnt India-rubber.

Microscopic structure.—A transverse section shows the wood to consist of thick walled wood cells and numerous large vessels, most of which are full of dark brown resin. The medullary rays are composed of single rows of cells also filled with resin.

Commerce.—Aloes wood fetches from Rs. 8—12 per pound according to quality.

ARISTOLOCHIACEÆ.

Aristolochia indica, *Linn., Rheede Hort. Mal. viii., t.* 25. The root and stem.

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* Resin of Boswellia serrata. † Resin of Shorea robusta ‡ Acorus calamus.

Vernacular.—Isharmúl (*Hind.* and *Beng.*), Ich-chura-múli, Perumarindu (*Tam.*), Sápsan (*Bomb.*), Sápus (*Goa.*)

History, Uses, &c.—Like many of the genus this plant enjoys a reputation as a remedy for snake-bites. It is mentioned in Sanskrit works as Arkamula and Sunandá, and is described as attenuant, deobstruent, emmenagogue, antarthritic, and a valuable medicine in the bowel affections of children who are teething. In the Mahometan Materia Medica it is known as Zarawand-i-Hindí, and is admitted as an Indian substitute for Zarawand (Aristolochia longa). The early Portuguese settlers in India gave it the name of Raiz de Cobra, on account of its supposed efficacy against the bite of that snake. Ainslie notices its use by the Tamil doctors in the bowel complaints of children, and says they sometimes call the drug Talashroolivayr. He also says that the powder is taken internally in cases of snake-bites, and applied to the bitten part. Loureiro (Flor. Cochin-Chin., Vol. II., p. 528), speaking of the plant, says: ‘ Prodest in colica, cibi inappetentia, febribus intermittentibus, obstructionibus, hydrope.” Fleming (Catalogue of Indian Plants, p. 8,) notices its use in Upper India as an emmenagogue and antarthritic. According to Ainslie, A. indica is the Catelæ-vegon of Rheede, and the Radix puloronica of Rumphius, who states that in Banda it is employed in decoction in diseases of the intestines, and also in intermittent fevers. The plant is placed in the secondary list of the Pharmacopœia of India, but no further information with regard to its medicinal properties is to be gathered from that work. In Bombay Sápsan is chiefly prescribed in the bowel complaints of children and in cholera; it is regarded as a stimulant tonic, and is also applied externally to the abdomen. Babu T. N. Mukharji states that the juice of the fresh leaves is very useful in the croup of children, by inducing vomiting, without causing any depression. (Ams. Cat., p. 21.)

Description.—The drug as found in the shops consists of the root and stem, the latter in by far the largest proportion; in many parcels the stem only is to be found. It is either in short pieces, or the whole stem may be twisted into a kind of circular bundle. The thickest portion of the stem is ¼ to ½ an inch or more in diameter, and has a central woody column made up of about ten wedge-shaped portions. The bark is thick and corky, marked with longitudinal ridges, and numerous small warty projections; it is of a yellow-brown colour. The taste is bitter and camphoraceous, and the odour aromatic and agreeable.

Microscopic structure.—The wedge-shaped woody columns are traversed by large vessels, the medullary rays are distinct and easily traced into the bark; in the latter, which consists of starchy and corky parenchymatous tissue, there is a circular zone of large yellow stony cells.

Chemical composition.—An alcoholic tincture evaporated yields a quantity of yellow bitter resin, and some yellow colouring matter soluble in water.

Commerce.—The drug can hardly be called an article of commerce, as it is supplied to the shops by herbalists or country people. It is very abundant in the Goa territory. Value, annas 6 per lb.

Aristolochia bracteata, *Retz., Obs.* 80. The plant.

Vernacular.—Kiramár (*Hind.*), Gandatí, Kiramár (*Bomb.*), Gadide-gada-para-aku, Kadapara (*Tam.*)

History, Uses, &c.—This plant grows best in the black soil of Western India. It is called Katrabunghá in Sanskrit, and is much used by Hindu physicians on account of its bitter, purgative and anthelmintic properties. The leaves are applied to the navel to move the bowels of children, and are also given internally in combination with castor oil as a remedy for colic. The juice of the fresh leaves or the powder of the dried leaves is a favourite application to sores to destroy maggots. Dr. Hove, who visited Bombay in 1787, found the plant growing in great abundance in Guzerat. He tells us that the root and leaf are remarkably bitter, and yield a thick yellowish juice, which is mixed with boiled milk and given in syphilis, and combined with opium is used with great success in gonorrhœa. Ainslie notices the application of the leaf when bruised and mixed with castor oil, to obstinate psora (the Carpang of the Tamils). The plant is also thought to stimulate uterine contraction, and is administered in tedious labour and as an emmenagogue. In Dalzell and Gibson's Flora of Bombay (p. 225) it is spoken of as possessing a merited reputation as an antiperiodic in intermittent fevers. The native doctors in Bombay make a paste with water, of the plant, along with the seeds of Barringtonia acutangula, Celastrus paniculata and black pepper, and rub the whole body with it for the cure of malarial fevers.

Description.—The drug consists of the whole plant in fruit; the stems are striated, slender, and about as thick as a piece of whipcord; the leaves are of a pale, glaucous green, obtuse, heartshaped, with wavy edges, about 2 inches long and 1½ inch broad, when dry they are blackish; the capsules are ovate, ¾ of an inch long, ribbed, depressed at the apex, six-celled; each cell contains a column of heartshaped flat seeds, closely packed. The appearance of the seeds is peculiar, they look as if they had been cut out with a punch; one side is flat, black and rough from a number of irregular projections; the other is almost entirely occupied by two brown comparatively smooth lobular projections of a soft corky structure; these under the microscope are seen to be entirely composed of ovate, empty, dotted cells. The whole plant is nauseously bitter.

Commerce.—The shops are supplied by the coasting boats which come from Guzerat and Kattiawar after the close of the rainy season. Value, Rs. 3½ per Surat maund of 37½ lbs.

Zarawand-i-gird (*Pers.* and *Bomb.*) This is the imported root of Aristolochia rotunda, *Linn.*, a small plant with slender stems and almost sessile, obtusely cordiform leaves. The flowers are solitary in the axils of the leaves, tubular, yellow without, and orange brown within. The whole plant is acrid, aromatic and bitter. The root is tuberous, placentiform, hard and heavy when dry, more or less mammellated on the under surface, of a reddish brown colour; on the upper surface are the remains of several stems or small pits showing where they were attached; on the under surface one central scar marking the attachment of the rootlets. The substance is very hard and horny, and has a bitterish somewhat aromatic taste, and camphoraceous odour. Zaráwand-i-gird or mudahraj is considered by Persian writers on Materia Medica to be the female of Aristolochia longa. Mír Muhammad Husain tells us that at Ispahan it is called Nukhud-i-alwandi. Mahometan physicians describe it as resolvent, stimulating, pectoral, stomachic, and cephalic; they prescribe it in jaundice and gout. True Zaráwand-i-gird is very scarce in Bombay, most of the druggists when asked for it supply the small starchy, inert tuber of an arum. (*Vide* Penilia.)

Zarawand-i-tawil (*Pers.*) This is the imported root of the Aristolochia longa, *Linn.*, *Mill. Ic.*, *t.* 51., *f.* 2, a plant much resembling A. rotunda, and having a similar habitat. It differs from the latter plant in having petioled leaves, yellow flowers striped with brown, and a cylindical root which has much the same taste and odour as that of A. rotunda. Mahometan physicians describe it as resolvent, deobstruent, diuretic emmenagogue, alexipharmic, and vermifuge.*

Bragantia Wallichii, *R. Br.*, *Rheede Hort. Mal. vi.*, *t.* 28. The Alpam of the Malabar Coast is a shrub; leaves alternate, oblong, lanceolate, 3-nerved at the base; tube of the perianth smooth; lobes of the limb acutish; anthers nine, three adelphous, united by threes; pistil very short; stigmas nine, radiating, united at the base, three of them bifid; fruit terete. (W. and A. in Ed. Phil. Jour., 1832.) The plant is found within the southern limits of the Bombay Presidency and at Goa. Drury tells us that the whole plant, mixed with oil and reduced to an ointment, is said to be very efficacious in the treatment of psora or inveterate ulcers. Like other plants belonging to the same natural order, it is supposed to have virtues in the cure of snake bites; the juice of the leaves mixed with Acorus calamus is administered internally, whilst the root reduced to a paste with limejuice is applied externally.

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* Compare with the description of the two Aristolochias in Dioscorides (iii. 4.) *περὶ αριστολοχίας στρογγύλης*

EUPHORBIACEÆ.

Croton oblongifolium, *Roxb.* The root-bark.

Vernacular.—Baragach (*Beng.*), Ganasúr (*Bomb.*), Gonsurong (*Goa.*)

History, Uses, &c.—The medicinal properties of the root of this tree appear to be little known. I have been unable to find any notice of the drug in works on Indian Materia Medica. Roxburgh, though he describes the tree as common in forests near Calcutta, is silent upon the subject. Dalzell and Gibson in the Bombay Flora (p. 231) remark that, "the plant is used medicinally by the natives to reduce swellings." When on a visit to Goa in 1876, my attention was drawn by the native doctors to the root-bark of a small tree as being one of the most valuable medicines they possessed; this plant, unknown to me at the time, proved on subsequent investigation to be C. oblongifolium. The Goanese and inhabitants of the Southern Concan administer the bark in chronic enlargements of the liver and in remittent fever. In the former disease it is both taken internally and applied externally. As an application to sprains, bruises, rheumatic swellings, &c., it is in great request. In large doses it is said to be purgative. Flückiger and Hanbury (Phar., p. 510,) state that the seeds are said to be sometimes substituted for those of C. tiglium. The tree is rare in the Bombay Presidency, and has only been found in the Southern Concan, where it has a reputation as a remedy in snake bites. In Goa it is common.

Description.—Trunk straight; bark ash-coloured, and pretty smooth; leaves petioled, alternate, and thickly set about the ends of the branchlets, spreading or drooping, oblong, serrate, obtuse-pointed, very smooth on both sides, from six to twelve inches long, petioles round and smooth, with a lateral gland on each side of their apices; stipules small, caducous; racemes terminal, generally solitary, erect, shorter than the leaves; flowers solitary, a few female ones mixed with many male ones, small, of a pale yellowish green; bracts 3-fold, one flowered, on the inside of each of the small lateral bracts is a round permanent gland, as in Sesamum indicum; male calyx deeply 5-cleft, petals six, smaller than the calyx, very woolly; filaments twelve, distinct, nine in the circumference and three in the centre, woolly towards the base; female calyx and corol as in the male; stamens none; germ globular; styles three, each divided into two very long, variously bent segments; capsules globular, fleshy, six-furrowed, tricoccous. (*Roxb.*) The root is twisted, often somewhat flattened, bark thickish, externally light brown and scaly, internally yellowish, mottled with brown, substance compact and resinous, odour highly aromatic, taste peppery and camphoraceous. Wood white, compact and hard.

Microscopic structure.—Sections of the bark show that the epidermis consists of about five rows of elongated cells placed horizontally, their walls are much thickened by a dark brown deposit, which produces a patchwork appearance. The parenchyma is loaded with large globular or oval highly refractive bodies of a yellowish colour; there are also numerous dark purplish brown particles, which are sometimes single but usually arranged in irregular concentric rows; they appear to be due to a deposit in the vascular system of a resinous nature.

Croton hypoleucos, *Dalz. in Hook. Jour. Bot. iii.*, 123. *Vern.*—Pándhari. The bark is used as a bitter and stomachic. (*Vide* C. bicolor, *Roxb.*, Fl. Ind. III., p. 680.)

Croton Tiglium, *Linn.*, *Bentl. and Trim.*, *t.* 239. The seeds and oil.

Vernacular.—Jamálgota (*Hind.* and *Bomb.*), Jaypál (*Beng.*), Nerválam (*Tam.*)

History, Uses, &c.—The ancient Hindu books make no mention of Croton oil. It appears to have always been the custom in India to administer the seeds after suitable preparation. This is done by removing the envelopes and embryo, and boiling the kernel in milk. One seed is a sufficient dose for an adult. Sanskrit writers under the names of Jayapála and Kanakaphala describe the seeds as heating, drastic and vermifuge; especially useful in constipation and dropsy; they are an important ingredient in various purgative compounds, of which the following, translated from the Bhavaprakasa by Dutt, may be taken as a specimen:—

"*Mahanaracha rasa.*—Take Chebulic myrobalans, pulp of Cassia fistula, Emblic myrobalans, root of Baliospermum montanum (danti), Picrorhiza Kurroa (tikta), milky juice of Euphorbia neriifolia (snuhi), root of Ipomæa Turpethum (trivrit), and the tubers of Cyperus rotundus (mustaka), each one tolá (180 grs.): pound them to a coarse powder, and boil in four seers of water till the latter is reduced to one-eighth. Then take a tolá of husked Croton seeds, tie them in a piece of thin cloth, and boil them in the above mentioned decoction, till the latter is reduced to the consistence of a fluid extract. To this extract add a powder composed of eight parts of purified Croton seeds, three parts of ginger, and two of black pepper, mercury, and sulphur in quantity sufficient to make a pill mass; rub them together for twelve hours, and make into two grain pills. These are given with cold water in tympanitis, colic, ascites,

&c., as a drastic purgative. After the operation of this medicine, rice should be given with curdled milk and sugar. (Dutt's Hindu Mat. Medica, p. 229.) Ainslie identifies Croton-seeds with the فل of Serapion, but Ibn Sina and later Mahometan writers treat of them under the names of Dand, Hab-es-salátin, or Hab-i-Khatai (Cathay seeds). They describe them as detergent, a purgative of phlegm, black bile, and adust humours; and recommend their use in dropsy, calculus, gout, and other diseases arising from cold humours. On account of its irritant action upon the fauces, the seed after having been boiled in milk is to be crushed and enclosed in a raisin for administration. The author of the Makhzan remarks that the Hindus give small doses with fresh ginger tea, to children, as a remedy for whooping cough. He also notices its irritant action upon the skin, and its use as an external application to tumours, &c.; should excessive purging occur he directs limejuice to be administered. The envelopes of the seed and plumule must always be rejected. Croton tiglium was first described by Christoval Acosta in 1578, afterwards by Rheede in 1679, and Rumphius in 1743. In 1812, Drs. White and Marshall brought the use of the seeds as a purgative to the notice of Europeans in India. The former gentleman gives the following directions for their administration, which he received from a learned Parsee Vydia of Surat:—"After having removed the shells from the seeds, tie the kernels in a small piece of cloth, like a bag; then put this into as much cowdung water as will cover the bag, and let it boil; secondly, when boiled, split the kernels in two and take a small leaf from them, which is said to be poisonous; and thirdly, pound the whole into a mass, to which add two parts of Katha (catechu), and divide into pills of two grains each, two of which are sufficient for one dose." The addition of the Katha is said to correct the acrimony of the drug, and to prevent any griping of the bowels.

Ainslie (*Mat. Indica*, Vol. I., p. 105,) notices the use of the expressed oil (nervalum unnay) by the Tamils as an external application in rheumatic affections, but it does not appear to have been used for internal administration until the year 1821.

(Confer. London Medical Depository for January 1822.) Croton tiglium was for many years cultivated at Hewra in the Deccan for the Government of Bombay.

Description.—Croton seeds are oblong, about half an inch long and not quite ⅖th of an inch broad. The dorsal and ventral surfaces are arched, the former more prominently than the latter. The testa is black, but covered for the most part by a thin cinnamon-coloured membrane; it is thin and brittle, and contains an abundant oily albumen enclosed in a delicate white membrane (endopleura). Between the two halves of the albumen are two foliaceous cotyledons, and a short thick radicle. The structure of these parts closely resembles that of the albumen and embryo of Ricinus communis.

Chemical composition.—The following summary is from the Pharmacographia:—" The principal constituent of Croton seeds is the fatty oil, the Oleum Crotonis or Oleum Tiglii of Pharmacy, of which the kernels afford from 50 to 60 per cent. That used in England is for the most part expressed in London, and justly regarded as more reliable than that imported from India, with which the market was formerly supplied. It is a transparent, sherry-coloured, viscid liquid, slightly fluorescent, and having a slight rancid smell, and an oily acrid taste. Its solubility in alcohol (·794) appears to depend in great measure on the age of the oil, and the greater or less freshness of the seeds from which it was expressed, oxidized or resinified oil dissolving the most readily. We found the oil which one of us had extracted by means of bisulphide of carbon to be levogyre.

" Croton oil consists chiefly of the glycerinic ethers of the common fatty acids, such as stearic, palmitic, myristic and lauric acids. They partly separate in the cold; the acids also may partly be obtained by passing nitrous acid through Croton oil. There are also present in the latter, in the form of glycerinic ethers, the more volatile acids, as formic, acetic, isobutyric, and one of the valerianic acids. The volatile part of the acids yielded by Croton oil contains, moreover, an acid which was regarded by Schlippe (1858)) as angelic acid, $C^5 H^8 O^2$. Yet in

1869 it was shown by Geuther and Frölich to be a peculiar acid, which they called *Tiglinic acid.* Its composition answers to the same formula, $C^4 H^7 COOH$, as that of angelic acid; but the melting points (angelic acid 45°, tiglinic 64° C.), and boiling points (angelic acid 185°, tiglinic 198·5°,) are different.

"The *drastic principle* of Croton oil has not yet been isolated. Bucheim suggested that the action of the oil depends upon '*Crotonoleic acid,*' which, however, he failed in isolating satisfactorily. It is remarkable that the wood and leaves of Croton tiglium appear to partake of the drastic properties of the seeds." (*Op. cit.*, 2nd Ed., p. 565.) H. Senier (Pharm. Journ., 3rd Series XIV., 446, 447,) has shown that when alcohol (sp. gr. ·794—·800) is mixed in equal volumes with English pressed Croton oil, perfect solution takes place, the mixture being permanent at all ordinary temperatures, and this is equally true when any less quantity of alcohol is used, when, however, the proportion of alcohol to Croton oil becomes as seven volumes to six, or any larger proportion of alcohol, then a part of the Croton oil separates. This part varies in quantity in the case of different samples of oil. That part of the Croton oil which separates when the alcohol is in excess is afterwards insoluble in any proportion of alcohol. But that portion of the oil dissolved by alcohol is, when separated, soluble in all proportions. The author has shown that the part of Croton oil soluble in alcohol contains the vesicating principle, while the portion insoluble in alcohol is entirely non-vesicating. He also shows that the purgative properties of Croton oil reside entirely in this insoluble, non-vesicating part. The author has endeavoured to ascertain to what constituent of the soluble portion of the oil the vesicating properties are due, and has traced these properties to the non-volatile fatty acids, chiefly to those which have the lowest melting points, are least readily saponified by alkalies, and are first liberated when the alkali soap is decomposed by acids. He attributes the purgative action not to the free acids, but to the combination in which they exist in the oil. His experiments towards the isolation of the new acid possessing the purgative properties are still in progress.

Commerce.—Jamálgota seeds usually sell for Rs. 5½ per maund of 41 lbs. They are imported from China viâ Singapore.

Baliospermum montanum, *Müll.—Arg., Wight Ic., t.* 1885. Croton polyandrum, *Roxb.*, Dánti (*Sans., Hind., Beng.* and *Bomb.*), affords seeds resembling those of C. tiglium, and having similar properties; they are often sold as Jamálgota by the druggists. The root, Dánti-múl, is much used in flatulence, retained secretions, anasarca, and jaundice. It is administered with aromatics. The following formula from Chakradatta may be taken as an example. (Confer. Dutt's Hindu Mat. Med., p. 230):—

"*Dánti haritaki.*—Take 25 large Chebulic myrobalans and enclose them in a piece of cloth, then take of the roots of Baliospermum montanum and Ipomæa Turpethum, each 200 tolás, water 64 seers, boil them together till the water is reduced to 8 seers. Strain the decoction, take out the Chebulic myrobalans and fry them in 32 tolás of Sesamum oil. To the strained decoction add 200 tolás of old treacle, then boil till reduced to the proper consistence for a confection. Now add to the mass the following substances, powdered root of Ipomæa Turpethum 32 tolás, long pepper and ginger, each 8 tolás, and stir them well; when cool add 32 tolás of honey, cinnamon, cardamoms, tejpat leaves, and the flowers of Mesua ferrea, each 8 tolás, and prepare a confection. The Chebulic myrobalans should be kept embedded in the medicine. Two tolás of the confection and one of the myrobalans are to be taken every morning."

Description.—Roots nearly straight, seldom branched, about as thick as the little finger; bark brown, scabrous; wood yellowish white, soft and tough.

Microscopic structure.—The outer layer of the bark consists of several rows of brick-shaped brown cells, mostly empty, but some of them containing a dark reddish brown resin; within this the parenchyma is so loaded with conglomerate raphides that its structure is with difficulty seen; it has many cells filled with resin as in the suber, and very numerous yellow liber cells. The wood is loaded with starch.

Macaranga tomentosa, *Wight Ic., t.* 817.

Vernacular.—Chándwar (*Mar.*)

A small tree, common in the Concan, with peltate, cordate leaves, small green flowers, and fruit the size of a pea. The young shoots and fruit are covered with a clammy, reddish secretion having an odour like turpentine. The country people use the following in *Jarandi* (*Angl.*, Liver):—One part of the young shoots, with 3 parts of the young shoots of Khoréti (Ficus asperrima) are sprinkled with hot water and the juice extracted; in this is rubbed down 2 parts each of the barks of both trees. The preparation may be administered twice a day in doses of ⅛th of a seer.

Euphorbia neriifolia, *Linn., Rheede Hort. Mal. ii., t.* 43; *DC. Plant. Gras., t.* 46. The juice and root.

Vernacular.—Sehund, Thohar (*Hind.*), Mansasíj (*Beng.*), Newarang, Mingut (*Bomb.*), Ilaik-kalli (*Tam.*)

History, Uses, &c.—This plant, called Snuhi in Sanskrit, is sacred to Mansá, the goddess of serpents. In some parts of India, in July and August, on Tuesdays and Thursdays, the natives approach the tree with offerings of rice, milk, and sugar, praying to be delivered from snake-bites. They also employ the root mixed with black pepper as a medicine for the cure of snake-bites internally and externally. Dutt informs us that in Bengal on the fifth day after the full moon of the month Srawan it is planted in the court-yard of Hindu houses and worshipped. The plant abounds in an acrid milky juice, which is a popular application to warts and other cutaneous affections. The native doctors purify arsenious acid by packing it in a hole made in a piece of the stem, closing the hole and exposing the stem to the action of fire until it is charred. The milky juice of E. neriifolia is described by Sanskrit writers as purgative and irritant; it is usually administered internally by soaking other purgatives and aromatics in it, so that by absorption of the juice their purgative properties become increased. A similar method is adopted when the juice is applied externally, a tent or issue pea being prepared with some finely powdered drug and steeped in it. Ainslie tells us that the native practitioners prescribe the juice as a purge and deobstruent, in those visceral obstructions and dropsical affections which are consequent of long-continued intermittent fever, the quantity given for a dose being about ¼th of a pagoda weight (20 grs.) Externally mixed with margosa oil it is applied to limbs which have become contracted from rheumatism. (Confer. Mat. Ind., Vol. II., p. 97.) In Bombay the root is mixed with country liquor to make it more intoxicating, and the juice is used to kill maggots in wounds. There is also a curious custom here in connection with this plant. At the time of the Dewali the Hindus* cut a portion of the stem, hollow it out, and fill it with oil, in which they place a wick. The little lamp thus formed is lighted and carried from house to house with the object of depositing it unextinguished in the house of some friend or acquaintance, saying at the same time, 'A son-in-law for you,' that is, wishing them good fortune (Nevadunga). The people of the house pretend not to want it, and try to extinguish the light by throwing water at it. These lamps are also placed upon little heaps of cowdung and worshipped. In the Concan the stem is roasted in ashes, and the expressed juice, with honey and Borax, given in small doses to promote the expectoration of phlegm, sometimes the juice of Adulsa is added. For asthma Mudar flowers, Aghada root, and Gokaran root are steeped in the juice, powdered and given with honey and

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* The custom is mostly confined to the Concan Brahmins.

Chebulic myrobalans. Dose about 4 grains. The author of the Makhzan-el-Adwiya, under the name of Zakúm (Euphorbia), describes four Indian species which are probably E. antiquorum, *Linn.*, E. neriifolia, *Linn.*, E. nivulia, *Buch.*, and E. Tirucalli, *Linn.* The milky juice of the first, he says, is mixed with the flour of Cicer arietinum, roasted, and administered in pills as a remedy for gonorrhœa. It has a strong purgative action. The juice of the second and third species is heated and dropped into the ear for the cure of earache; heated with salt it is given as a remedy in whooping cough, asthma, dropsy, leprosy, enlarged spleen, dyspepsia, jaundice, flatulence, colic, calculus, tumours, &c. The fourth species yields a milky juice, having similar properties.*

Description.—Shrubby, often arboreous; branches sharply 5-angled, stipulary thorns twin; leaves subsessile, oblong, about 3 inches long, appear in the rainy season; flowers greenish-yellow, February-March.

The root is thick, soft and woody, often of considerable size and much contorted; bark thick, of a light brown colour, warty and fissured; rootlets numerous; juice milky. The milk dries into a greyish waxy mass if collected, and the bark shrivels up and becomes papery, like that of some other milky shrubs.

Chemical composition.—The milky juice of the Euphorbias mentioned in this article does not appear to have been chemically examined, but it probably differs little from that of Euphorbia resinifera, which yields the Euphorbium of commerce, an article which is always obtainable in the Bombay shops under the name of Farfiyun, and the chemical composition of which is thus described by Flückiger in Wittstein's Viertel jahresschrift fur prakt. Pharmacie, 1868, and in the Pharmacographia. The drug analysed consisted of selected fragments free from extraneous substances :—

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* Sprengel identifies E. neriifolia with the ماهو دانه of Ibn Sina. This is the Hab-el-mulúk of the Persians, a purgative seed of a reddish brown colour and like a vetch. The author of the جامع says that the name should be ماهو بذاته and remarks اي قايم بنفسه اي انه يقوم بذاته في الاسهال that is to say, it is sufficient as a purgative without the assistance of any other drug. Ibn Sina describes the fruit as tricoccous and like a large filbert; he says, the name of the plant is Shibáb; it grows in Central Asia. Both Máhúdanah and Shibab are Persian words.

Amorphous resin, $C^{10} H^{16} O^{2}$	38
Euphorbon, $C^{13} H^{22} O$	22
Mucilage	18
Malates, chiefly of calcium and sodium...	12
Mineral compounds................................	10
	100

The amorphous resin is readily soluble in cold spirit of wine, containing about 70 per cent. of alcohol. The solution has no acid reaction, but an extremely burning acrid taste; in fact, it is to the amorphous indifferent resin that Euphorbium owes its intense acridity. By evaporating the resin with alcoholic potash, and neutralizing the residue with a dilute acid, a brown amorphous substance, the *Euphorbic acid* of Buchhein, is precipitated. It is devoid of the acridity of the resin from which it originated, but has a bitterish taste. From the drug deprived of the amorphous resin as above stated ether or petroleum takes up the *Euphorbon,* which may be obtained in colourless although not very distinct crystals, which are at first not free from acrid taste; but by repeated crystallizations, and finally boiling in a weak solution of permanganate of potassium, they may be so far purified as to be entirely tasteless. Euphorbon is insoluble in water; it requires about 60 parts of alcohol, sp. gr. 0·830, for solution at the ordinary temperature. In boiling alcohol Euphorbon dissolves abundantly, also in ether, benzol, amylic alcohol, chloroform, acetone, or glacial acetic acid.

Euphorbon melts at 116° C. without emitting any odour. By dry distillation a brownish oily liquid is obtained, which claims further examination. If Euphorbon dissolved in alcohol is allowed to form a thin film in a procelain capsule, and is then moistened with a little concentrated sulphuric acid, a fine violet hue is produced on contact with strong nitric acid slowly added by means of a glass rod. The same reaction is displayed by lactucerin, to which in its general characters Euphorbon is closely allied.

The mucilage of Euphorbium may be obtained from that portion of the drug which has been exhausted by cold alcohol and by ether. Neutral acetate of lead, as well as silicate or borate of sodium, precipitate this mucilage, which therefore does not agree with gum arabic.

If an aqueous extract of Euphorbium is mixed with spirit of wine, and the liquid evaporated, the residual matter assumes a somewhat crystalline appearance, and exhibits the reactions of *Malic acid.* Subjected to dry distillation, white scales and acicular crystals of *Maleic* and *Fumaric acids,* produced by the decomposition of the malic acid, are sublimed into the neck of the retort. A sublimate of the same kind may sometimes be obtained directly by heating fragments of Euphorbium. Among the mineral constituents of the drug, chloride of sodium and calcium are noticeable; scarcely any salt of potash is present. Flückiger has since extracted Euphorbon from the juices of E. Cattimandoo and E. Tirucalli; it is probably present in all the Euphorbias.

Euphorbia hirta, *Burm. Zey., t.* 104.
,, **thymifolia,** *Burm. Pl. Alm., t.* 113, *f.* 2.

Vernacular.—Dúdhí, Nayetí (*Bomb.*) Two common weeds which flourish at all seasons of the year on gravel walks and waste ground in Bombay have a reputation as vermifuges.

Description.—E. hirta: Annual, hairy, obliquely-erect, with the apices recurved; leaves opposite, obliquely-oblong, serrulate; flowers small, numerous, in globular, axillary, shortly-peduncled clusters.

E. thymifolia: Branches pressing flat on the earth, coloured, hairy; leaves opposite, obliquely-ovate, serrate, flowers axillary, crowded on short peduncles, small, greenish; calyx and corolla each of four semi-lateral parts. The Sanskrit name is Raktavinduchada, the Persian Hazárdánah.

Euphorbia parviflora, *Burm. Zey., t.* 105, *f.* 2; *Vernacular*—Dhákatí dúdhí, has similar properties.

All three of these Euphorbias are known by the name of Nayetí in the Southern Concan, on account of the use of the juice for the cure of ringworm (Herpes); the juice is also used, mixed with chloride of ammonium, to cure dandriff.

Euphorbia Tirucalli, *Linn., Rheede Hort. Mal. ii., t.* 44; Thor, Niwal (*Bomb.*), Kalli (*Tam.*), Milk Hedge (*Eng.*), is extremely common in Guzerat, and is universally used as a blistering agent and purge; it is also considerad to be anti-venereal, the milk is given internally mixed with ghí. Flückiger has shown that it contains Euphorbon. It is probably the Dihn دهن of the Arabs. In the Concan 1 to 4 drops of the juice are given with treacle or gram flour as a purge, and the charcoal, which is very light, is used for making pastiles.

Jatropha Curcas, *Linn., Jacq. Hort. Vind.* 3, *t.* 63. The seeds and juice.

Vernacular.—Janglí arandí (*Hind.*), Bág-bherenda (*Beng.*), Moghlí-erendí (*Bomb.*), Kattámanakku (*Tam.*), Galamárk (*Goa.*)

History, Uses, &c.—This tree is called by Sanskrit writers Kánana-eranda. Its seeds are sometimes used as a purgative and alterative by the Hindu physicians, but on account of their uncertain action they are not much esteemed. The oil is reckoned a valuable external application to itch, herpes, chronic rheumatism, and sores or wounds. The leaves are applied as a rubefacient and discutient, and a decoction of them is said to excite the secretion of milk in women. The viscid juice which flows from the stem upon incision is painted over cuts and wounds to check bleeding and promote healing; this it does by forming a thin film when dry like that produced by collodion. The author of the Makhzan also notices this use of the juice, and calls the plant *Bághréndeh.* Mr. Udoy Chund Dutt notices the hæmostatic properties of the juice, and Dr. Evers has injected a drachm of it into a varicose aneurism. He says:—"The result was astonishing; in twenty minutes time the pulsation was so faint that no non-professional person could have detected it; and by evening all pulsation had ceased, and a good firm clot had been produced. No ill effects resulted from the injection." J. Curcas is said to have been introduced from Brazil by the Portuguese; it is now quite naturalized in many parts of India, and is a common hedge plant in the Concans. The oil is used for burning. The juice when dried in the sun forms a bright reddish brown, brittle substance like shell-lac, which may yet be put to some useful technical purpose. In Goa the root-bark is applied externally in rheumatism. In the Concan it is rubbed with a little Asafœtida and given with Buttermilk in dyspepsia and diarrhœa. The fresh stems are used as a tooth brush to stop bleeding from the gums. Roxburgh notices that the leaves warmed and rubbed with castor oil are used by the natives as a suppurative. Jatropha oil has been tried as a purgative by European physicians, but has been found very uncertain in its action. Christison (Poisons, p. 591,) found from 12 to 15 drops to have generally the same effect as an ounce of castor oil. Stillé and Maisch remark that it is more like Croton oil in its action. The acrid emetic principle resides chiefly in the embryo. It is stated that if the embryo is wholly removed four or five of the seeds may be used as a purgative without producing either vomiting or griping. This opinion is supported by experiments upon dogs. A number of cases have occurred of poisoning by eating the seeds entire. In one case a man who had eaten five of them soon complained of burning in the mouth and throat, and the whole abdomen felt distended and sore. In a few minutes vomiting occurred, and was repeated five times in the course of an hour, accompanied with active purging. The pain continued; the patient complained of feeling hot and giddy; he then became delirious, and afterwards insensible. On regaining consciousness several hours later his face was pale, his hands cool, the pulse 110 and weak. He recovered. In 1854, at Birmingham, more than thirty boys were poisoned by eating these seeds. In some of them besides the symptoms just mentioned, there was a hot skin and an appearance of drowsiness, which may however have been due to exhaustion produced by the evacuations. They all made good recoveries. The oil applied to the skin irritates it. (Nat. Disp. 1884, p. 533.)

Description.—The young roots are soft, fleshy, and tapering, with a whity-brown scaly epidermis, and a few thin rootlets, bark yellowish-white internally, with a peculiar perfume like tuberose when freshly removed; wood white and very soft. On section the bark is seen to contain oil globules and very numerous conglomerate raphides; the vascular system is full of a yellowish viscid secretion; the wood is loaded with starch. The taste of the bark is acrid.

The fruit is ovoid, 6-striated, tricoccous and fleshy; when ripe it is of a pale greenish yellow, as it gradually dries up it becomes black and partially dehiscent. There is one seed in each cell. The seeds are of the same shape as castor oil seeds, $\frac{3}{4}$ of an inch long and rather less than half an inch broad; the dorsal surface is arched and marked by a hardly perceptible ridge about the middle; the ventral surface has a well marked ridge. At one end of the seed is a white scar. The testa is of a dull black and irregularly fissured all over, the fissures are yellowish. The kernel is enclosed in a thin white membranous covering like that of the castor oil seed.

The cotyledons are foliaceous, the radicle short and thick, the albumen is copious and oily.

Chemical composition.—The kernels of the seeds of J. curcas were found by Arnaudon and Ubaldini to contain 7·2 per cent. water, 37·5 oil, 55·3 sugar, starch, albumen, casein, and inorganic matters. The kernels yielded 4·8 per cent. ash, and 4·2 per cent. nitrogen; the kernels and husks together 6 per cent. ash, and 2·9 per cent. nitrogen. The oil yielded by saponification, glycerin and an acid, which, as well as the unsaponified oil, produced octylic alcohol by distillation with hydrate of potassium. According to Pelletier the active principle is an acid, which he has named Jatrophic.

Jatropha multifida, *Linn.*, *Dill. Elth.*, *t.* 173, *f.* 213, is a common ornamental shrub in Bombay gardens, it is not used medicinally, and only requires a brief notice on account of its seeds, which are powerfully purgative and emetic, sometimes giving rise to accidents when eaten by children. The plant is easily recognised by its multifid leaves and beautiful red coral-like panicles of flowers. The fruit is bright-yellow when ripe, as large as a walnut, six-angled and three-celled, each cell contains a scabrous black seed resembling that of J. curcas. Limejuice and stimulants are the best remedies in cases of poisoning by these seeds. The plant appears to have been introduced by the Portuguese from Brazil, where the oil of the seeds is known as 'Pinhoen' oil, and is used as an emetic.

Jatropha glandulifera, *Roxb.*

Vernacular.—Undarbibi, Janglí-erandí (*Bomb.*), Lál-bherenda (*Beng.*)

History, Uses, &c.—This plant appears to have been introduced into this part of India, but it is not known from whence it came. Graham in his Catalogue of Bombay Plants, published in 1839, says that in his time it was only to be found at Punderpore in the Deccan (a place much frequented by pilgrims who come to visit the temple of Vithoba). There is a fabulous legend that it suddenly made its appearance at this place. The following is the story, for which I am indebted to Dr. Shantaram V. Kuntak of Punderpore:—" A certain cultivator was sowing his field on the 10th day of Áshádh, during the Áshádhi fair; whilst thus engaged he was accosted by numbers of pilgrims who were passing by his field on their way out of the town to meet the palanquins of Dnyánoba, Námdeo and Tukáram, which are brought to Punderpore at this season from Paithan, Alandi and Dehu. All the pilgrims asked him what he was sowing, until the man got tired of answering their questions; in a short time another pilgrim came up and asked the same question, the man vexed beyond endurance, answered that he was sowing चोंट (Membrum virile). It is said that this last pilgrim was the god Vithoba in disguise, who was going to meet the palanquins of his devotees, and that annoyed at the cultivator's answer, he cursed him, saying, 'As you sow, so may you reap.' So when harvest time came instead of the usual crop the whole field was covered with this short thick-stemmed plant." Until within the last few years the field was called after the strange crop which it bore. It is now cultivated by a Mahometan, and produces a regular crop, but the Jatropha has not been entirely extirpated. Since Graham's time the plant has spread rapidly, and may be seen on waste ground in most parts of the island of Bombay, probably introduced along with the Castor seed of commerce. An oil is prepared from the seeds by roasting them in a perforated earthen vessel, fitted upon another vessel, into which, when the whole apparatus is heated in a pit filled with burning cow-dung fuel, the oil drops. This oil is valued as an application to chronic ulcerations, sinuses, ringworm, &c., the root brayed with water is given to children suffering from abdominal enlargement; it purges, and is said to reduce glandular swellings. The juice of the plant is used in various parts of India as an escharotic to remove films from the eyes; it is greenish and viscid. The expressed oil of the seeds is yellow, has a specific gravity of 0·963 and solidifies at 5° Cent. (J. Lepine, Jour. Phar. [3] XL., 16.)

Description.—A small shrub, remarkable for the shining reddish-brown colour of its young foliage. The leaves are palmate, 3 to 5-cleft, panicles terminal, short, few-flowered; flowers small and red. The young branches and petioles of the leaves are thickly studded with sticky red glandular hairs. The capsules are three-celled and three-seeded, with an outer adherent fleshy epicarp, which dries up as the fruit ripens; when this takes place the three triangular woody cells of which it is composed divide into six pieces suddenly with a sharp report, and the seeds are projected to a considerable distance; it is, therefore, necessary to gather the fruit before it is quite ripe and dry in a covered place. The seeds, including the strophiole, are three-tenths of an inch long and two-tenths broad; they are of a grey colour with two brown stripes on the dorsum, which is convex, the under side has two flat surfaces, divided by a central ridge. The kernel is without smell, and very oily; it has a sweet, nutty taste. Under the microscope it is seen to consist of a delicate stroma, loaded with small oil globules.

Jatropha nana, *Dalz.*, Kirkundí (*Mar.*), is a rare plant, found in waste, stony places near Poona. The juice is employed as a counter-irritant in the same manner as that of J. glandulifera.

Description.—A shrub 1 to 1½ foot high, all smooth; root tuberous, woody; root-bark thick and full of milky juice; stem round, smooth, very little branched; branches erect; leaves large for the size of the plant, sessile or shortly petioled, broadly ovate, entire or trilobate; lobes obtuse, central much the largest, 4 to 6 inches long and broad, pale beneath, 3-nerved; flowers panicled, terminal, few, 3 to 5 on each division; stipules minute; flower solitary, pedicelled, subtended by a subulate bract half its length; calyx leaves six, small, subulate; fruit obovoid, flattened at the top, slightly six sulcated, as large as a nut. (*Dalz.*)

Phyllanthus Emblica, *Linn.*, *Rheede Hort. Mal. i., t.* 38; *Gärt. Fruct.* 2, *t.* 108. The fruit.

Vernacular.—Anvula (*Hind.*), Amlaki (*Beng.*), Avalkati, Avala ((*Bomb.*), Toppi (*Tam.*)

History, Uses, &c.—The Emblic myrobalan, in Sanskrit Amalaki and Dhatri, is an important article of the Hindu Materia Medica. It is used both fresh and dried; in the former condition it is considered to be refrigerant, diuretic and laxative; in the latter astringent. A sherbet of the fruit, sweetened with sugar or honey, is a favourite cooling drink for sick people; it is said to be diuretic. A country side prescription for biliousness in the Concan is, Avala, 4 massa, to be soaked all night in water, and in the morning to be pounded and mixed with a quarter seer of milk and flavoured with sugar and cummin. Emblic myrobalans are an ingredient in many compound preparations described in Sanskrit works. A selection of these prescriptions will be found in Dutt's Hindu Materia Medica; the following translated from Chakradatta may be taken as an example:—

"*Dhátri lauha.*—Take of powdered Emblic myrobalans 64 tolás, prepared iron 32 tolás, liquorice powder 16 tolás, mix them together, and soak in the juice of Tinospora cordifolia seven times successively. This preparation is given in jaundice, anæmia and dyspepsia, in doses of from 20 to 40 grains."

Mahometan physicians esteem this myrobalan equally with the Hindus; they describe it as astringent, refrigerant, cardiacal, and a purifier of the humours of the body. It is much prescribed by them in fluxes, and is also applied externally on account of its cooling and astringent properties. The Arabic name is Amlaj, and the Persian Ámala. Ainslie tells us that the flowers, which have an odour resembling that of lemon peel, are supposed by the Vytians to have virtues of a cooling and aperient nature, and are prescribed in conjunction with other articles in the form of an electuary. (Mat. Indica II., p. 244.) In the Pharmacopœia of India it is stated upon the authority of Dr. Æ. Ross, that the root by decoction and evaporation yields an astringent extract equal to catechu, both for medicinal purposes and in the arts; the chips of the wood or small branches thrown into impure or muddy water, according to the same authority, clear it effectually. In the Concan the juice of the fresh bark, with honey and turmeric, is given in gonorrhœa.

Description.—Fresh Emblic myrobalans are globular, fleshy, smooth, six-striated, of a yellowish green colour, and sometimes as large as a walnut; they contain an obovate obtusely triangular, 3-celled nut, each cell of which contains two triangular seeds. The taste of the pulp is acid, astringent, and somewhat acrid. The dried fruit is the size of a cob nut, sub-hexagonal, wrinkled, of a grey black colour if it has been collected when immature, but yellowish brown if mature; the latter upon pressure breaks up into six parts, each of which consists of a section of the pulp and nut, and contains one triangular brown seed. Two kinds of Avala are found in commerce, one entire, and the other cut up, and the nut removed. Emblic myrobalans contain a notable quantity of sugar.

Commerce.—The fruit is collected in many parts of India. Value, Rs. 32 per kandy of 7 cwts.

Phyllanthus Niruri, *Mull.-Arg., Rheede Hort. Mal. x., t.* 15.
,, **urinaria,** *Linn., Pluk. Alm., t.* 183, *f.* 5.
} The plants.

Vernacular.—P. Niruri, Jaramla (*Hind.*), Bhuí-amla (*Beng.*), Bhuí-avala (*Bomb.*), Kizhkáy-nelli (*Tam.*) P. urinaria bears the same names, with the addition of the adjective red.

History, Uses, &c.—These plants are common weeds which appear in the rainy season. The name Bhumyámlaki which occurs in Sanskrit works is probably applicable to both. Hindu physicians consider P. Niruri to be deobstruent, diuretic, and healing; they prescribe the dried plant in powder or decoction in jaundice. The dose of the powder is about a teaspoonful. Mír Muhammad Husain in his Makhzan tells us that the milky juice of P. Niruri is a good application to offensive sores, and that a poultice of the leaves with salt, cures scabby affections of the skin; without salt it may be applied to bruises, &c. From Ainslie we learn that these two plants are the Herba mœroris alba and rubra of Rumphius, and that an infusion of the leaves of P. Niruri with fenugreek seed is considered a valuable remedy in chronic dysentery, also that the leaves are a good stomachic bitter. In Bombay P. Niruri is used as a diuretic in gonorrhœa and acidity of the urine. The dose is 2 tolás of the juice with 2 tolás of ghí twice a-day. The root rubbed down with rice water is given in the Concan as a remedy for menorrhagia.

Description.—P. Niruri: Annual, erect-branched; branches herbaceous, ascending; floriferous branchlets filiform; leaves elliptic, mucronate, entire, glabrous; male and female flowers in separate axils, male on the lower ones; dehiscence of anthers transverse; glands in the female bifid and trifid; capsule globose; two smooth seeds in each cell; seeds triangular. (Bombay Flora.)

P. urinaria: Root generally annual, though in some soils bi- and even perennial. Stem erect, striated, of a pale reddish colour; branches several, ascending, striated from the insertions of the stipules; leaves scattered, spreading, pinnate, from one to two inches long, flower-bearing; leaflets alternate, linear oblong, entire, smooth, ¾ of an inch long, and ¼ broad; petioles compressed, somewhat triangular; stipules of the petioles 3 fold, acute, membranaceous, those of the leaflets two, lateral; male flowers, exterior leaflets axillary, 2 to 3, subsessile; calyx, nectary and stamens as in P. Niruri; female flowers, lower leaflet axillary, solitary, sessile; calyx and nectary as in the male; capsules scabrous, 3-celled, 6-valved; seeds, two in each cell, transversely striated on the outside. It is immediately distinguished from P. Niruri by its sessile flowers, and scabrous capsules. (*Roxb.*)

Phyllanthus madraspatensis, *Linn.*, *Wight Ic.* 1895, *f.* 3. Kanocha (*Bomb.*) The seeds are polished, triangular, of a grey colour, prettily marked with delicate dark brown lines like basket work; length $\frac{1}{10}$ of an inch; breadth somewhat less; one side of the seed is arched, the other presents two sloping surfaces united to form a longitudinal ridge, at the pointed end is a small scar marking its attachment to the ovary; the testa is hard and brittle. When soaked in water it immediately becomes thickly coated with a semi-opaque mucilage, the kernel is oily and has a sweet nutty taste, the seed is used medicinally on account of the mucilage which it affords. For a description of the plant, confer. Roxburgh's Flora Indica, III., 654.

Phyllanthus reticulatus, *Poiret.*, *Wight Ic.*, 1899.

Vernacular.—Panjolí (*Hind.*), Kámohí (*Sind.*), Púlavayrputtay (*Tam.*), Krishna-kámbojí (*Sans.*), Pavana (*Bomb.*), Datwan (*Guz.*); the fruit, Píkapírú (*Sind.*); the leaves, Kámohí-jo-pun (*Sind.*); the bark, Kámohí-jo-chodo (*Sind.*)

The leaves are used as a diuretic and cooling medicine in Sind, the bark as an alterative and attenuant. Ainslie says:—"This bark, as it appears in the Indian bazars, is commonly in pieces about a foot long, and as thick as the wrist, of a dark colour outside, and of a faint sweetish taste; it is considered as alterative and attenuant, and is prescribed in decoction, in the quantity of 4 ounces or more twice daily." In the Concan the juice of the leaves is made into a pill with Camphor and Cubebs and dissolved in the mouth as a remedy for bleeding from the gums; it is also, along with the juice of other alterative plants, reduced to a thin extract, and made into a pill with aromatics. This pill is given twice a day rubbed down in milk as an alterative in heat of blood.

Description.—Shrubby, climbing, primary branches twiggy; young shoots pubescent; floriferous branchlets angular; leaves oval-obtuse, bifarious; flowers axillary, aggregated, several males and usually one female; male flowers purplish; berries size of a pea, dark purple. This plant is common near water, and extends to Sind, where it is found in the forests of great size, climbing to the tops of the highest trees. (*Bomb. Flora.*) It has a peculiar and disagreeable smell. The bark is dark brown externally and thickly studded with little elliptic warty rings; beneath the suber is a deposit of chlorophyll, but the substance of the bark is of a dull red colour. Taste sweet and astringent. Microscopically there is little to remark beyond masses of deep purple pigmentary matter and groups of large stone cells.

Ricinus communis, *Linn.*, *Bentl. and Trim.*, *t.* 237. The oil and root.

Vernacular.—Arandi (*Hind.*), Erendi (*Bomb.*), Bherenda (*Beng.*), Amanakkam-chedi (*Tam.*)

History, Uses, &c.—The root and oil of the seeds of this plant, which is called in Sanskrit Eranda and Ruvuka, have long been used by Hindu physicians on account of their purgative properties. Two varieties, red and white, having similar properties, are mentioned in Sanskrit medical works. The earliest notice of the plant is by Susruta in the Ayurveda. Besides its purgative action, the Hindus consider the castor oil plant to be of special efficacy in rheumatic affections. Dutt informs us that one of its Sanskrit synonyms is Vátári or anti-rheumatic. Decoctions of the seeds or root are usually administered in such cases; somewhat similar preparations are used as collyria. It is the κίκι of Herodotus, the κρότων of Theophrastus, and the κίκι or κρότων of Dioscorides (iv., 158), who observes that the name κρότων is given to the seed on account of its resemblance to an insect known by that name. He also notices Castor oil and its medicinal use. It is the Ricinus of Pliny (15, 7.) The Arabic name of the plant is Khirvá and the Persian Bedánjir. Mahometan writers describe two kinds, red and white, the red is said to be the most active. They consider the oil a powerful resolvent and purgative of cold humors, and prescribe it in palsy, asthma, colds, colic, flatulence, rheumatism, dropsy and amenorrhœa; of the seeds, 10 kernels rubbed down with honey are sufficient as a purge. A poultice of the crushed seeds is used to reduce gouty and rheumatic swellings, and inflammation of the breasts of women during lactation. The leaves have similar properties but in a less degree. The fresh juice is used as an emetic in poisoning by opium and other narcotics; made into a poultice with barley meal it is applied to inflammatory affections of the eye. The root bark is used as a purgative and alterative in chronic enlargements and skin diseases; it is also applied externally. In the Bombay Lying-in Hospital the leaves are applied to the breasts of women to stop the secretion of milk. In the Concan the oil is applied to eruptions of the skin supposed to be due to heat of blood.

Description.—The roots are tolerably straight and give off a few rootlets; they are covered by a light brown bark, nearly smooth, but marked with little transverse warty ridges. The wood is white and soft. The bark has an acrid taste.

The seeds are contained in a tricoccous capsule, one in each cell; they are oblong, from ¼ to ½ an inch long and about ⅓ of an inch broad, the dorsal surface is more arched than the ventral. The apex is somewhat pointed, below it is a tumid caruncula on the removal of which a dark depressed cicatrix is seen. The testa is grey marked with brown blotches. The kernel is enclosed in a delicate white membrane, and consists of a copious white albumen in the axis of which are situated two leafy cotyledons and a short stout radicle.

Microscopic structure.—The epidermis of the seeds is composed of tabular cells, which are here and there coloured in patches which correspond to the spots on the seed. The testa consists of cylindrical cells in close apposition. The kernel is a mass of closely-packed cells with granular contents, but if water is brought in contact with the section oil globules separate from the albumen. In the latter may be demonstrated the Aleurone crystals which are found in many seeds. (Confer. Sachs Lehrbuch der Botanik, p. 554.) The root bark shows numerous cells filled with a yellow refractive substance which appears to be resinous, in other respects it is not remarkable.

Chemical composition.—The most important constituent of the seed is the fixed oil called castor oil, of which the peeled kernels afford at most half of their weight. The following summary of its chemistry is extracted from the Pharmacographia:—"The oil if most carefully prepared from peeled and winnowed seeds by pressure without heat, has but a slightly acrid taste, and contains only a very small proportion of the still unknown drastic constituent of the seeds. Hence, the seeds themselves, or an emulsion prepared with them, act much more strongly than a corresponding quantity of oil. Castor oil, extracted by absolute alcohol or by bisulphide of carbon, likewise purges much more vehemently than the pressed oil.

"The castor oil of commerce has a sp. gr. of about 0·96, usually a pale yellow tint, a viscid consistence, and a very slight yet rather mawkish odour and taste. Exposed to cold, it does not in general entirely solidify until the temperature reaches —18° C. In thin layers it dries up to a varnish-like film.

"Castor oil is distinguished by its power of mixing in all proportions with glacial acetic acid or absolute alcohol. It is even soluble in four parts of spirit of wine (·838) at 15° C., and mixes without turbidity with an equal weight of the same solvent at 25° C. The commercial varieties of the oil, however, differ considerably in these as well as in some other respects.

"The optical properties of the oil demand further investigation, as we have found that some samples deviate the ray of polarized light to the right and others to the left.

"By saponification, castor oil yields several fatty acids, one of which appears to be *Palmitic Acid.* Another acid (peculiar to the oil), is *Ricinoleic Acid,* $C^{18} H^{34} O^{3}$; it is solid below 0° C.; does not solidify in contact with the air by absorption of oxygen, and is not homologous with oleic or linoleic acid, neither of which is found in castor oil. Castor oil is nevertheless thickened, if 6 parts of it are warmed with 1 part of starch and 5 of nitric acid (sp. gr. 1·25), *Ricinelaïdin* being thus formed. From this, *Ricinelaïdic Acid* may easily be obtained in brilliant crystals.

"As to the albuminoid matter of the seed, Fleury (1865) obtained 3·23 per cent. of nitrogen, which would answer to about 20 per cent. of such substances. The same chemist further extracted 46·6 per cent. of fixed oil, 2·2 of sugar and mucilage, besides 18 per cent. of cellulose.

"Tuson, in 1864, by exhausting castor oil seeds with boiling water, obtained from them an alkaloid which he named *Ricinine.* He states that it crystallizes in rectangular prisms and tables, which when heated fuse, and upon cooling solidify as a crystalline mass; the crystals may even be sublimed. Ricinine dissolves readily in water or alcohol, less freely in ether or benzol. With mercuric chloride, it combines to form tufts of silky crystals, soluble in water or alcohol. Werner (1869) on repeating Tuson's process on 30 lbs. of Italian castor oil seeds, also obtained a crop of crystals, which in appearance and solubility had many of the characters ascribed to Ricinine, but differed in the essential point that when incinerated they left a residuum of magnesia. Werner regarded them as the magnesium salt of a new acid. Tuson repudiates the suspicion that Ricinine may be identical with Werner's magnesium compound. E. S. Wayne of Cincinnati (1874) found in the leaves of Ricinus, a substance apparently identical with Tuson's Ricinine; but he considers that it has no claim to be called an alkaloid.

"The testa of castor oil seeds afforded us 10·7 per cent. of ash, one-tenth of which we found to consist of silica. The ash of the kernel previously dried at 100° C., amounts to only 3·5 per cent." (Pharmacographia, 2nd. Ed., p. 569.)

Commerce.—The castor oil plant is extensively cultivated in Guzerat and Khandeish. Two distinct varieties of seed are found in the market, large and small; the latter yields the best oil, and is worth on an average Rs. 25 per kandy of 5½ cwts. The average value of the Bazar oil is Rs. 16 per cwt. The Bombay Sanitary Establishments are supplied with cold drawn oil expressed at the Store Depôt, the price charged being 4 annas per lb. In 1881-82, Bombay exported 77,224 cwts. of castor seed, valued at Rs. 4,11,627; of this quantity Italy took 64,185 cwts. and France 12,425 cwts. In 1884-85 the exports from the whole of India reached 477 thousand cwts. The oil exported was 174,590 gallons, of which 154,018 gallons went to the United Kingdom. The small variety of seed is exported. The oil of the large variety is much used in India for greasing machinery and similar purposes.

Phyllanthus rhamnoides, *Willd., Wight Ic.*, 1900. *Vern.*—Surasaruni (*Hind.*), Aruni (*Sans.*) This plant is found in the Southern Concan but is not common. According to Ainslie it was brought to Dr. F. Hamilton while in Behar as a medicine of some note; the dried leaves are smoked like tobacco, in cases in which the uvula and tonsils are swelled.

Description.—1 to 1½ foot high, a little shrubby; young shoots angular; leaves alternate, short-petioled, spreading, broad-oval; exterior ones largest, below whitish, entire, half to three-quarters of an inch long; male flowers racemed from the lower axils; female flowers in the upper axils, solitary, short peduncled, drooping; flowers curious; capsule size of a pea. (*Bomb. Flora.*) Further information upon the medicinal properties of this plant is wanted.

Mallotus philippensis, *Müll., Bentl. and Trim., t.* 236. The glands.

Vernacular.—Kamála, Kampilla (*Hind.* and *Bomb.*), Kamélámavu (*Tam.*), Kamila (*Beng.*)

History, Uses, &c.—Kamála, the Kampilla or Rechanaka of Sanskrit writers, is a red powder which is collected from the capsules of M. philippensis; it is also present in smaller quantities and of a less brilliant colour upon other parts of the plant. This substance has probably been used as a dye by the Hindus from a very remote period. Its medicinal properties are described in their principal treatises on medicine. (Confer. Chakradatta and the Bhavaprakasa.) With regard to its economic uses in India, Drury affords us the following information:—"The dye is used all over India, especially for silk, to which it imparts a fine yellow colour. It is rarely used for cotton. When the capsules are ripe in February or March they are gathered, the red powder is carefully brushed off and collected for sale, no preparation being necessary. The Hindu silk dyers use the following method:—Four parts of powder, one of powdered alum, two of salts of soda (as sold in the bazars) are rubbed well together with a small quantity of oil of Sesamum. When well mixed this compound is boiled in water proportionate to the silk to be dyed, and kept boiling smartly, according to the shade required, turning the silk frequently to render the colour uniform." (Useful Plants of India, p. 285.) The earlier Arabian writers appear to have confounded this drug, which they named Kinbíl (the Sanskrit name converted into an Arabic form) with a substance called Wars, produced in Arabia and Ethiopia, having particles somewhat similar to Kamála, but of a deep purple colour; the red Kinbíl or Wars mentioned by them was probably all imported from India, for we have no proof, as far as I am aware, that M. philippensis grows in Arabia or North-East Africa. Both Kamála and Wars yield a rich yellow dye. The author of the Kámús, who wrote about A. H. 768, notices both Kinbíl and Wars, but treats them as two distinct substances; he says of Kinbíl, that it is red and astringent, and that it kills and expels intestinal worms, and cures scabby affections of the skin تقتل الديدان وتخرجها وتنفع الجرب والسعفة منفعةً بيّنةً Of Wars, he says the plant is like Sesame, only found in Arabia, &c. Externally applied it removes freckles; taken internally it cures leprous eruptions نافع للكلف طلاءً والبهق شرباً ولبس الثوب المورّس مقوي على الباءة not a word about anthelmintic properties.* The author of the Makhzan tells us that Kinbíl is an Arabic form of the Persian Kampilla and Hindi Kamila; he then recapitulates the various opinions held as to the source of the drug, and concludes by saying, "I have heard that it is the pulp of the fruit of a mountain tree like the *Ma'asfar*, but its leaves are rather larger, and it is armed with long stiff thorns, and has fruit like a lime, which is green when young and red when ripe; when ripe it bursts open and a dull red substance escapes and falls on the ground: this is collected and is Kinbíl." Regarding its properties, he says that in doses of from 1 to 2 dirhems rubbed into an emulsion with any suitable vehicle it expels all kinds of intestinal worms, and at the same time acts as a purgative. Speaking of Wars, the same author says that there is a black kind, which comes from Ethiopia, and is called '*Habshí*,' and a dull red kind which is called Indian, and is the worst (as a dye); he concludes by saying the seeds of the Wars are like Másh (Phaseolus radiatus). There is no mention of its use as an anthelmintic; it is described as an aphrodisiac, lithontriptic, and remedy for ringworm, pityriasis and freckles. Sprengel thought that the source of Wars was Memecylon tinctorium. (Confer. Hist. Med., t. II., p. 444, ed. tert.; also Hist. rei Herb., t. I., p. 258.) The first Indian European author who noticed Kamála was Buchanan in his "Journey through Mysore," &c., in 1807; it has also been noticed by Ainslie, Roxburgh and Royle, but Mackinnon of Bengal, in 1858, was the first to introduce it into European practice in India; since then it has been used with success by many medical men in India and Europe. Previous to this Vaughan had sent Kamála to Hanbury from Aden under the name of Wars, and had described its use as a dye and remedy in certain skin diseases. (Confer. Pharm. Journ., Vol. xii., p. 386, 1853.) The true Arabian Wars does not appear to have attracted attention in Europe until 1867, when it was imported by Messrs. Allen and Hanburys of London. The source of Wars remained unknown until 1884, when it was ascertained to be the glands of the pod of Flemingia Grahamiana, *W. and A.*, a leguminous plant common in Arabia and India, but, as far as I can ascertain, the drug has never been collected in the last named country, nor does it appear to be known as an import from Arabia. As noticed in the Pharmacographia, the names Kinbíl and Kamála are not in use at Aden; the Indian Kamála is there known as Wars.

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* Rhazes and the older medical writers who mention Kinbil as a vermifuge do not identify it with Wars; some think it to be a kind of manna, others an earth.

Description.—Kamála is a red powder, which varies in depth of colour, mixed with it are greenish yellow fragments of the capsule of the plant; like lycopodium it is inflammable and resists admixture with water. Alcohol and ether dissolve a considerable portion of it, and the solution poured in water emits a melon-like odour.

Microscopic structure.—Each grain of Kamála is a spherical body, consisting of an outer delicate membrane within which may be seen a structureless mass of yellow colour, in which are embedded numerous club-shaped cells, arranged with their thick ends outwards; in order to examine these cells the drug must be exhausted of its resin by alcohol and potash. The hairs which are found mixed with the glands are stellate, each hair being one-celled and thick walled.

Chemical composition.—The following summary is extracted from the Pharmacographia:—"Kamála has been analysed by Anderson of Glasgow (1855) and by Leube (1860). From the labours of these chemists, it appears that the powder yields to alcohol or ether nearly 80 per cent. of resin. We find it to be soluble also in glacial acetic acid or in bisulphide of carbon, not in petroleum ether. By treatment of the resin extracted by ether with cold alcohol, Leube resolved it into two brittle reddish yellow resins, of which the one is more easily soluble and fuses at 80° C., and the other dissolves less readily and fuses at 191° C. Both dissolve in alkaline solutions, and can be precipated by acids without apparent change.

"Anderson found that a concentrated ethereal solution of Kamála allowed to stand for a few days, solidified into a mass of granular crystals which by repeated solution and crystallization in ether, were obtained in a state of purity. This substance, named by Anderson *Rottlerin,* forms minute, platy, yellow crystals of a fine satiny lustre, readily soluble in ether, sparingly in cold alcohol, more so in hot, and insoluble in water. The mean of four analyses gave the composition of Rottlerin as $C^{22} H^{20} O^{6}$.

"We have been able to confirm the foregoing observations so far as that we have once obtained an abundance of minute acicular crystals, by allowing an ethereal solution of Kamála to evaporate spontaneously to a syrupy state. But the purification of these crystals which was attempted by our friend, Mr. T. B. Groves, was unsuccessful, for when freed from the protecting mother-liquor, they underwent a change and assumed an amorphous form. We have, on the other hand, succeeded in isolating the crystals from the '*Kamalin*,' as sold by E. Merck of Darmstadt. By fusing them with caustic potash we obtained paraoxybenzoic acid." (Pharmacographia, 2nd Ed., p. 574.)

Commerce.—Kamála is collected in the North-West Provinces, the Concans and Madras; the berries are gathered and shaken and rubbed in a basket to separate the glands. The value of the drug in Bombay is about Rs. 11 per maund of 41 lbs.

Aleurites moluccana, *Willd., Rumph. Amb.* 2, *t.* 58; *Gärt. Fruct.* 2, *t.* 25.

Vernacular.—Janglí-akrot (*Hind.*), Japhal (*Bomb.*) The Belgaum or Indian Walnut of Anglo-Indians is cultivated in Western India, but does not appear to have been applied to any useful purpose. The medicinal properties of the oil have been examined by Dr. O. Rorke (Ann de Thèrap., 1859, p. 117,) who found that in doses varying from 1 to 2 ounces it acted as a mild and sure purgative, producing in from three to six hours after ingestion free bilious evacuations, its operation being unattended either by nausea, colic or other ill effects. (Phar. of India, p. 203.) From more recent experiments it appears that half an ounce of the oil is a sufficient aperient. The following description of the tree by A. A. Black is given in the 'Treasury of Botany':—" The only species of Aleurites, A. triloba, called the Candleberry tree, forms a tree of considerable magnitude, attaining the height of 30 to 40 feet, and, though originally a native of the Moluccas, and the S. Pacific Isles, is commonly cultivated in tropical countries for the sake of its nuts. The leaves are alternate, four to eight inches long, stalked and without stipules, either oval-acute and entire, or from three to five lobed, and like all the young parts covered with a whitish starry pubescence. The flowers are small and white, growing in clusters at the apex of the branches, the males and females together in the same cluster, the former being the most numerous. The fruit is 2-celled, fleshy, roundish, and when ripe of an olive colour, its greatest diameter about 2½ inches; each cell contains one ovoid somewhat flattened nut, the shell of which is very hard and thick; the kernel is conform to the nut, white and oily. The kernels when dried and stuck on a reed, are used by the Polynesian Islanders as a substitute for candles; and as an article of food in New Georgia. They are said to taste like walnuts. When pressed they yield a large proportion of pure palatable oil, used as a drying oil for paint, and known as country walnut oil and artist's oil. In Ceylon it is called Kekuni oil, and in the Sandwich Islands, where it is used as a mordant for their vegetable dyes, Kakui oil. In these islands alone about 10,000 gallons are annually produced. It has been imported into this country (England) but not to any considerable extent, and fetches about £20 per imperial ton. The cake after the oil has been expressed, is esteemed as a food for cattle, and also as manure. The root of the tree affords a brown dye, which is used by the Sandwich Islanders for their native cloths. The plant is known in India under the name of Indian Akrot," or Walnut.

Chemical composition.—The average weight of the husks is 6·5 grams, of the almonds 3·3 grams. Composition of husks: Water 3·71, Organic matter 89·90, Mineral matter 6·39. Composition of almonds: Water 5·25, Fat (extracted by carbon sulphide) 62·97, Cellulose and other organic matters 28·99, Mineral matter 2·79. Composition of the ash of the almond: Lime 18·69, Magnesia 6·01, Potash 11·33, Phosphoric anhydride 29·30. The fatty matter extracted from the almonds by carbon sulphide at ordinary temperatures forms a transparent, amber yellow, syrupy liquid When cooled to —10° it becomes viscous, but neither loses its transparency nor changes colour. (Nallino, Gaz. Chim. Ital. II., 257).

Acalypha indica, *Linn., Rheede Hort. Mal. x., t.* 81. The plant.

Vernacular.—Kuppí (*Hind.*), Khoklí (*Bomb.*), Kuppaimeni (*Tam.*)

History, Uses, &c.—I have not met with any description of this plant in native works on Materia Medica, although it appears to be well known to the herbalists. Ainslie gives Arittamunjayrie as the Sanskrit name and Shwet-busunta as the Bengali; he has the following notice of the plant:—" The root, leaves and tender shoots are all used in medicine by the Hindus. The powder of the dry leaves is given to children in worm cases, also a decoction of them with the addition of a little garlic. The juice of the same part of the plant, together with that of the tender shoots, is occasionally mixed with a small portion of margosa oil, and rubbed on the tongues of infants for the purpose of sickening them and clearing their stomachs of viscid phlegm. The hakíms prescribe the Koopamaynee in consumption. It would appear from Rheede's account of this plant, that on the Malabar Coast, the root is supposed to have a purgative quality; his words are:— " Radix trita, et cum aqua calida assumpta, cathartica est; folia trita et cum aqua epota ventrem laxant; illorum dococtum auribus immissum mitigat dolorem;" he calls it " Curpameni." (Mat. Indica, Vol. II., p. 161.)* In the Pharmacopœia of India (p. 205), the following reference to this plant by Dr. G. Bidie, of Madras, will be found :—"The expressed juice of the leaves is in great repute, wherever the plant grows, as an emetic for children, and is safe, certain, and speedy in its action. Like Ipecacuanha, it seems to have little tendency to act on the bowels or depress the vital powers, and it decidedly increases the secretion of the pulmonary organs. The dose of the expressed juice for an infant is a teaspoonful." Dr. Æ. Ross speaks highly of its use as an expectorant, ranking it in this respect with senega; he found it specially useful in the bronchitis of children. The purgative action of the root noticed by Rheede (Hort. Mal. X., p. 161, t. 81,) is confirmed by Dr. H. E. Busteed, who has used it as a laxative for children. In Bombay the plant has a reputation as an expectorant, hence the native name Khoklí (cough). Brigade Surgeon Langley, in a communication to Dr. Watt's *Econ. Dict., Ind.*, Vol. I., writes :—"This plant is called in Canara *Chálmári* as well as Kuppi. The natives use it in congestive headaches : a piece of cotton is saturated with the expressed juice and inserted into each nostril; this relieves the head symptoms by causing hæmorrhage from the nose. The powder of the dry leaves is used in bedsores and wounds attacked by worms. In asthma and bronchitis I have employed it with benefit both for children and adults." Dr. Langley recommends a tincture of the fresh herb made with spirits of ether (3 ozs. to one pint), dose 20 to 60 minims frequently repeated during the day in honey; it acts as an expectorant and nauseant, in large doses it is emetic.

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* The Mercurialis annua, a closely allied and very similar plant, the *λινόζωστις* or *ἑρμου πόα* of the Greek and *Mercurialis* of the Romans, was administered by them as a purgative and emmenagogue, and its juice dropped into the ear to cure defluxions from the eyes. Dios., iv., 183; Plin. 25, 5 Apul., Platon., 84.

Description.—Stem erect, from 1 to 2 feet high, branchy, round, smooth ; leaves scattered, petioled, ovate-cordate, three-nerved, serrate, smooth, about 2 inches long and 1½ broad ; petioles as long as the leaves ; stipules small, subulate ; spikes axillary, generally single, peduncled, erect, as long as the leaves, many-flowered, crowned with a body in the form of a cross, the base of which is surrounded with a three-leaved calyx, the arms of the cross are tubular, with their mouths fringed, from the base of the cross on one side issues a style-like thread, with a fringed stigma, the body of the cross contains an ovate seed like substance ; male flowers numerous, crowded round the upper part of the spike, calyx four-leaved, leaflets cordate, filaments minute, numerous ; female flowers below the male, remote ; involucre cup-formed, with an opening on the inner side, striated, smooth, toothed from 2 to 4-flowered ; calyx three-leaved. (*Roxb.*)

In Bombay A. indica is not nearly so abundant as A. ciliata, *Mull.—Arg.*, which is one of the commonest road-side weeds towards the end of the monsoon. Ainslie notices the use of A. fruticosa, *Forsk.*, as a stomachic and alterative (II., 388.); an infusion of the leaves is used.

Briedelia montana, *Willd.*, *Roxb. Cor. Pl.* 2, *t.* 172, Asáná (*Bomb.*), Múlú-ven-ga (*Tam.*), Fatarfoda (*Goa.*), is a short thick tree, with spreading branches, with or without thorns, according to situation and soil. The bark is externally of a light-brown colour, and has little fungous protuberances of dead suber ; internally it is smooth and fibrous, of a cinnamon colour ; taste purely astringent. If soaked in water it gives out much mucilage. The fibrous portion of the bark is very tough and strong. Sections placed under the microscope show the outer portion to be made up of thin-celled reddish parenchyma ; in the inner portion there is much woody fibre and numerous vessels, the external surface of which is encrusted with large crystals arranged in regular columns. Briedelia bark is well known as a valuable astringent in Western India. The Goanese consider it to be lithontriptic, hence the name *Fatarfoda*, ' Stone crusher.'

Crozophora plicata, *Müll.-Arg.*, *Burm. Ind.*, *t.* 62, *f.* 1, is a common weed on cultivated ground in the cold weather. It is reputed to have alterative properties, and is said to be sometimes prescribed in leprosy, but we have no exact information as to its properties. I have not seen it used in Bombay. Ainslie gives Suryavarti as the Sanskrit and Somballi as the Hindustani name.

Securinega leucopyrus, *Müll.* *Syn.*—Fluggea virosa, Párpo (*Goa.*), is a thorny shrub common in Goa in waste uncultivated places. The juice of the leaves, or the leaves made into a paste with tobacco, are used to destroy worms in sores. Roxburgh remarks that the bark possesses the power of intoxicating fish.

Tragia cannabina, *Linn.* *Vernacular.*—Kânchkúri, Khájkolti (*Bomb.*), Kásághini (*Sans.*), Sirrú-kânchori-vayr (*Tam*). This plant is not uncommon in hedges in Guzerat and the Deccan. Ainslie says:—"The root, which is sometimes called 'Coorundootievayr,' has in its dried state but little taste or smell, though in its more succulent condition, it has a rather pleasant odour; it is considered as diaphoretic and alterative, and is prescribed in decoction, together with other articles of like virtues, to correct the habit; an infusion of it is also given as a drink in ardent fever, in the quantity of half a teacupful twice daily."

Description.—Shrubby, climbing, 4 to 5 feet high; leaves petioled, 3-divided, serrate, hairy, 2 to 4 inches long; stipules half lanceolate; racemes erect, many-flowered; male flowers numerous on the upper part of the raceme, very small, yellow, each with three bracts; female flowers beneath the male, two on each raceme, with the calyx leaflets pinnatifid. The plant stings like the nettle. (*Bomb. Flora.*)

Tragia involucrata, *Müll.-Arg., Rheede Hort. Mal. ii., t.* 39; *Burm. Zeyl., t.* 92; Dústparisha (*Sans.*), Khâjkolti (*Bomb.*); Kánchúri-vayr (*Tam.*), has similar properties, and the root is used in cachexia and secondary syphilis. Rheede, Mal. II., p. 72, t. 39, says of it, "Conducit in febre ossium, ac servit pro pruritu corporis;" "in decocto data urinam suppressam movet." (Confer. Ainslie, 2—61.) Care should be taken in handling this plant, as the sting is very painful; it is common in shady places on the Western Ghauts. In the Concan the roots of these plants are used to aid the extraction of Guinea-worm, a paste made from them being applied to the part. A paste of the roots with Tulsi juice is also used as a cure for itchy eruption of the skin.

PIPERACEÆ.

Piper nigrum, *Linn., Bentl. and Trim., t.* 245. Black and White Pepper.

Vernacular.—Black Pepper, Kálí-mirch (*Hind.*), Golmirch (*Beng.*), Kálí-miri (*Bomb.*), Milagu (*Tam.*); White Pepper, Sufedmirch (*Hind.*), Sufed-miri, Pándharí-miri (*Bomb.*)

History, Uses, &c.—The earliest travellers from the West, who visited India, found the Pepper vine in cultivation on the Malabar Coast. Its berries were one of the first and most important articles of commerce between this country and Europe.* Sanskrit writers under the name of Maricha describe the Black and White Peppers as carminative, antiperiodic and acrid, and recommend them in intermittent fever, hæmorrhoids, and dyspepsia. Under the name of Trikatu, or the three-acrids, Round Pepper, Long Pepper and Ginger are ingredients in many Sanskrit prescriptions.

In obstinate intermittents the Hindus administer White Pepper in the following manner:—A quarter of a seer of Pepper is boiled over night in one seer of water until the water is reduced to one-fourth of its bulk, the decoction is allowed to cool during the night, and is taken in the morning. This dose is repeated for seven successive days. The use of Pepper for the cure of intermittents is strongly recommended by Stephanus in his commentary on Galen.

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* Theophrastus mentions two kinds of pepper (*πέπερι*) in the 4th century B.C., and 'Dioscorides mentions *λευκον πέπερι*, white pepper, *μακρόν πέπερι*, long pepper, and *μέλαν πέπερι*, black pepper (ii., 148).

In piles a confection of Black Pepper with other aromatics is given.

Mahometan writers call Pepper Filfil, an Arabic form of the Persian Pilpil; they describe it as deobstruent, resolvent, and alexipharmic; as a nervine tonic it is given internally and applied externally in paralytic affections; in toothache it is used as a mouth wash. As a tonic and digestive it is given in dyspepsia. With vinegar it forms a good stimulating poultice. With honey it is useful in coughs and colds; moreover it is diurectic and emmenagogue, and a good stimulant in cases of bites by venomous reptiles. Strong friction with pepper, onions and salt is said to make the hair grow again upon the bald patches left by ringworm of the scalp.

Description.—The immature fruit known as Black Pepper is globular, about $\frac{1}{5}$th of an inch in diameter, much wrinkled, and of a brown-black colour, on one side are the remains of the peduncle, and on the other of the style and stigmas. The pericarp is closely adherent to the seed. The latter consists of a thin reddish-brown testa and a copious albumen, the exterior portion of which is horny and the interior farinaceous. The embryo is undeveloped. The mature seed, known as White Pepper, is less acrid than Black, as the pericarp has been removed; it is also rather larger and of a grey colour, striated from base to apex by about a dozen light stripes.

Microscopic structure.—The following excellent description is taken from the Pharmacographia:—"The transverse section of a grain of Black Pepper exibits a soft yellowish epidermis covering the outer pericarp. This is formed of a closely packed yellow layer of large, mostly radially arranged, thick-walled cells, each containing in its small cavity a mass of dark-brown resin. The middle layer of the pericarp consists of soft, tangentially extended parenchyme, containing an abundance of extremely small starch granules and drops of oil. The shrinking of this loose middle layer is the chief cause of the deep wrinkles on the surface of the berry. The next inner layer of the pericarp exhibits towards its circumference, tangentially-arranged soft parenchyme, the cells of which possess either spiral striation or spiral fibres, but towards the interior, loose parenchyme free from starch and containing very large oil cells.

"The testa is formed in the first place of a row of small yellow thick-walled cells. Next to them follows the true testa, as a dense, dark-brown layer of lignified cells, the individual outlines of which are undistinguishable.

"The albumen of the seed consists of angular, radially arranged, large-celled parenchyme. Most of its cells are colourless and loaded with starch; others contain a soft yellow amorphous mass. If thin slices are kept under glycerine for some time, these masses are slowly transformed into needle-shaped crystals of piperin."

Chemical composition.—The following summary is from the Pharmacographia:—"Pepper contains resin and essential oil, to the former of which its sharp pungent taste is due. The essential oil has more of the smell than of the taste of pepper. The drug yields from 1·6 to 2·2 per cent. of this volatile oil, which agrees with oil of turpentine in composition as well as in specific gravity and boiling point. We find it, in a column 50 mm. long, to deviate the ray of polarized light 1°·2 to 3°·4 to the left.

"The most interesting constituent of pepper, *Piperin,* which pepper yields to the extent of 2 to 8 per cent., agrees in composition with the formula $C^{17} H^{19} NO^{3}$, like morphine. Piperin has no action on litmus paper; it is not capable of combining directly with an acid, yet unites with hydrochloric acid in the presence of mercuric and other metallic chlorides, forming crystallizable compounds. It is insoluble in water; when perfectly pure, its crystals are devoid of colour, taste, and smell. Its alcoholic solution is without action on polarized light. Piperin may be resolved, as found by Anderson in

1850, into *Piperic Acid*, $C^{12} H^{10} O^{4}$, and Piperidin, $C^{5} H^{11} N$. The latter is a liquid colourless alkaloid, boiling at 106° C., having the odour of pepper and ammonia and directly yielding crystallizable salts.

"Besides these constituents, pepper also contains some fatty oil in the mesocarp. Of inorganic matter, it yields upon incineration from 4·1 to to 5·7 per cent."

Commerce.—Bombay is supplied with Black Pepper from the Malabar Coast. White Pepper comes from Singapore. Value, Black Pepper, Rs. 95 to Rs. 105 per candy of 5¼ cwts. (the best quality is known as Koompta); White, Rs. 7¼ per ¼ cwt.

Chavak. Under this name the stem of the pepper plant is sold in the Bombay shops. It is jointed, about as thick as the little finger, and has the taste and odour of Black Pepper. The Sanskrit name is Shivika.

Pokli-miri. These are abortive pepper corns, and have long held a place in the Hindu Materia Medica. Garcia d'Orta notices the drug under the name of Canarese Pepper, and observes that it never finds its way to Portugal, but that it is valued as a medicine by the natives to purge the brain of phlegm, to relieve toothache, and as a remedy for cholera. I am inclined to think that this drug must be the aborted produce of the female vines of P. trioicum mentioned by Roxburgh. (Flora Indica I., 153.)

Piper officinarum, *C. DC. Miq., Ill. Pip., tt.* 34, 35; *Heyne xiv., t.* 21.
" **longum**, *Linn., Bentl. and Trim., t.* 244.
} The fruit and root.

Vernacular.—Piplí (*Hind.*, *Bomb.* and *Beng.*), Tippili (*Tam.*) The root, Pipla-múl (*Hind.*, *Bomb.* and *Beng.*), Tippilimúlam (*Tam.*)

History, Uses, &c.—Long Pepper, in Sanskrit Pippali, is an old-established article of the Hindu Materia Medica; the root, Pippali-múla, is also extensively used, and is found in every druggists' shop throughout the country.* Both drugs are considered stimulant, carminative, alterative, and laxative, and are prescribed in chest affections, dyspepsia, and palsy. Besides being administered by the mouth, these drugs enter into the composition of medicinal snuffs and liniments. Dutt gives us the following peculiar method of administering Long Pepper as an alterative tonic. An infusion of three Long Peppers is to be taken with honey on the first day, then for ten successive days the dose is to be increased by three peppers every day, so that on the tenth day the patient will take thirty at one dose. Then the dose is to be gradually reduced by three daily, and finally the medicine is to be omitted. Thus administered it is said to act as a valuable alterative tonic in paraplegia, chronic cough, enlargements of the spleen, and other abdominal viscera. (Chakradatta in Dutt's Hindu Mat. Med., p. 243.) Mahometan writers under the name of Dár-filfil describe Long Pepper as a resolvent of cold humours; they say it removes obstructions of the liver and spleen, and promotes digestion by its tonic properties, moreover it is aphrodisiacal, diuretic, and emmenagogue. Both it and the root (Filfil-muiyeh) are much prescribed in palsy, gout, lumbago, and other diseases of a similar nature. A collyrium of Long Pepper is recommended for night blindness; made into a liniment, it is applied to the bites of venomous reptiles. We learn from Roxburgh (Flora Indica I., p. 155) "that it is in Bengal only that Piper longum is cultivated for its pepper. When the ament is full-grown, it is gathered and daily exposed to the sun till perfectly dry; after which it is packed in bags for sale.* The roots and thickest part of the creeping stems when cut into small pieces and dried, form a considerable article of commerce all over India, under the name of Pippulamoola, for which purpose it is particularly cultivated in many of the valleys amongst the Sircar mountains. This sort is more esteemed, and bears a higher price than that of Bengal, where by far the largest portion is cultivated. It, as well as the pepper, is chiefly employed medicinally, and the consumption of both these drugs is very great." Piper longum was formerly cultivated at Poway, near Bombay; it appears to grow well in gardens in Bombay, but requires plenty of manure. In the Concan the roasted aments are beaten up with honey and given in rheumatism; they are also given powdered with Black pepper and Rock salt, 2 + 3 + 1, in half tolá doses for colic.

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* Dioscorides in his article upon the three peppers mentions a pepper root, and says it resembles costus, has a hot taste, and causes salivation when chewed.

Description.—The ament of P. longum is composed of a number of small berries crowded together round a common axis. The spikes vary in length, and taper slightly towards the apex. Each berry is about $\frac{1}{10}$th of an inch from base to apex and of an obovoid form, the structure is essentially the same as that of the fruit of P. nigrum. Long Pepper when freshly picked has hardly any aroma, in the process of drying it gradually developes an aromatic taste and odour.

Pipla-mul, or pepper root, when fresh is a fleshy, crooked, and knotted root about the size of a goose-quill, with many smaller rootlets branching from it. The cortical portion is very thick, and covered by a thin smooth brown epidermis. The central woody column is soft and divided into from 4 to 6 wedge-shaped portions by from 4 to 6 very conspicuous medullary rays.

Microscopic structure.—The epidermis of the root consists of several rows of tangentially extended brown cells. The parenchyme of the cortex is chiefly composed of large thin-walled cells loaded with starch, and containing drops of essential oil. Amongst them are scattered cells containing a refractive yellow substance (resin). The central woody column is also loaded with starch, and contains as many resin-cells as the cortex. The medullary rays are abundantly provided with large scalariform vessels.

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* P. officinarum is cultivated in Java and supplies Europe with Long Pepper,

The anatomy of the fruit hardly differs from that of Piper nigrum, but the albumen does not contain any volatile oil.

Chemical composition.—Generally considered to be similar to that of Black Pepper.

Commerce.—Three kinds of Long Pepper are met with in the Bombay market—1*st,* Singapore, which is identical with the Long Pepper of European commerce, and is produced by P. officinarum, C. DC.; 2*nd,* Bangálí, the produce of P. longum, *Linn.*, cultivated in Bengal; 3*rd,* Swahelí, imported from Zanzibar, a very inferior kind of pepper, the greater part of the catkins being immature, and no thicker than a knitting needle.

Value, Singapore, Rs. 7 to Rs. 12 per maund of 41 lbs.; Bengal, Rs. 9; Zanzibar, Rs. 5; Pípla-múl is also of three kinds, Mirzapore, Rs. 10 to Rs. 40; Bengal, Rs. 7 to Rs. 7½; Malwa, Rs. 50 per maund of 41 lbs.

Piper Cubeba, *Linn. f.*, *Bentl. and Trim.*, *t.* 243. The fruit.

Vernacular.—Kabáb-chíní (*Hind.*, *Bomb.* and *Beng.*), Válmilaku (*Tam.*)

History, Uses, &c.—This pepper is a native of Java, where it is called Cumac; it also grows in Nipal, and is there called Timmué and Taizbul. (Confer. Kirkpatrick's account of Nepaul, p. 70.) Ainslie gives Sugandha Marichu as the Sanskrit name. The early Arabian travellers mention it under the name of Kabábah, and probably introduced it into Europe. Cubebs was probably introduced into India at an early date by the Chinese. Nipal is not mentioned by Mahometan writers on Materia Medica as producing the drug. The author of the

Makhzan gives Mahílíyún as the Greek name, but as he describes two kinds of Cubebs, "*the large and the small*," and does not say to which of them the Greek name is applied, it is useless to attempt to trace the origin of the word. Some Mahometan writers give Karfiyún as the Greek name; this is evidently a corruption of καρπησιον, the name of an aromatic wood mentioned by Paulus Ægineta. It appears that cubebs were in the Middle Ages sometimes called Fructus carpesiorum. The hakíms regard it as stimulant, resolvent, and diuretic, and prescribe it in much the same manner as Black Pepper; its use in the treatment of gonorrhœa is of quite recent date (1815-18); before this it was regarded as having properties similar to Black Pepper, and was used as a spice. At the present time its special use in affections of the genito-urinary organs is well known throughout India.

Description.—The fruits are elevated on a kind of stalk, formed from the contraction of the base of the fruit itself, so that they are not really but only apparently stalked.

The dry berries are spherical, wrinkled, of a brown colour, and are easily distinguished from Black Pepper by the pedicel at their base; beneath the pericarp is a nut which contains the seed. The albumen is white and oily. As the fruit is gathered when immature, the drug usually consists of little else than the pericarp.

Microscopic structure.—The pericarp consists of an epidermis beneath which is an interrupted row of small thick-walled cells. Within this the parenchyme is composed of cells containing starch and oil, in the latter, bundles of needle-shaped crystals of cubebin may be observed; lastly, the innermost layer of the pericarp is formed by several rows of tangentially extended cells containing essential oil. The nut is yellow and brittle. The seed when present is seen to contain crystals of cubebin.

Chemical composition.—The Pharmacographia affords the following summary:—"The most obvious constituent of Cubebs is the volatile oil, the proportion of which yielded by the drug, varies from 4 to 13 per cent. The causes of this great variation may be found in the constitution of the drug itself, as well as in the alterability of the oil, and the fact that its prevailing constituents do not begin to boil below 264° C.

"It is, as shown in 1875 by Oglialoro, a mixture of an oil, $C^{10} H^{16}$, boiling at 158° to 163°, which is present to a very small amount, and two oils of the formula $C^{15} H^{24}$, boiling at 262° to 265° C. One of the latter deviates the plane of polarization strongly to the left, and yields the crystallized compound, $C^{15} H^{14}$ 2H Cl., melting at 118° C. The other hydrocarbon is less lævogyrate, and cannot be combined with H Cl. One part of oil of Cubebs, diluted with about 20 parts of bisulphide of carbon, assumes at first a greenish, and afterwards a blue colouration, if one drop of a mixture of concentrated sulphuric and nitric acids (equal weight of each acid) is shaken with the solution. The oil distilled from old Cubebs on cooling at length deposits large, transparent, inodorous octohedra of *camphor of cubebs*, $C^{30} H^{48} + 2O\ H^{2}$, belonging to the rhombic system. They melt at 65°, and may be sublimed at 148°. We have not succeeded in obtaining them by keeping the oil of fresh Cubebs for two years in contact with water, to which a little alcohol and nitric acid was added.

"Another constituent of Cubebs is Cubebin, crystals of which may sometimes be seen in the pericarp even with a common lens. It was discovered by Soubeiran and Capitaine in 1839; it is an inodorous substance, crystallizing in small needles or scales, melting at 125°, having a bitter taste in alcoholic solution. It dissolves freely in boiling alcohol, but is mostly deposited upon cooling; it requires 30 parts of cold ether for solution, and is also abundantly soluble in chloroform. We found this solution to be slightly lævogyre; it turns red on addition of concentrated sulphuric acid. If the solution of cubebin in chloroform is shaken with dry pentoxide of phosphorus, it turns *blue*, and gradually becomes red by the influence of moisture. Cubebin is nearly insoluble in cold, but slightly soluble in hot water. Bernatzik (1866) obtained from Cubebs 0·40 per cent. of Cubebin, Schmidt (1870) 2·5 per cent.

"The crystals which are deposited in an alcoholic or ethereal extract of Cubebs, consist of cubebin in an impure state. Cubebin is devoid of any remarkable therapeutic action; its composition, according to Weidel (1877), answers to the formula, $C^{10} H^{10} O^{3}$; by melting it with caustic potash, Cubebin is resolved as follows:—

$$C^{10} H^{10} O^{3}, 5O = CO^{2}\ C^{2} H^{4} O^{2},\ C^{6} H^{3} (OH)^{2} COOH.$$

Acetic acid. Protocatechuic acid.

"The resin extracted from Cubebs consists of an indifferent portion nearly 3 per cent., and of Cubebic Acid, amounting to about 1 per cent. of the drug. Both are amorphous, and so, according to Schmidt, are the salts of Cubebic Acid. Bernatzik, however, found some of them, as that of barium, to be crystallizable. Schulze (1873) prepared Cubebic Acid from the crystallized sodium-salt, but was unable to get it other than amorphous. The resins, the indifferent as well as the acid, possess the therapeutic properties of the drug.

"Schmidt further pointed out the presence in Cubebs of gum (8 per cent.), fatty oil, and malates of magnesium and calcium."

Commerce.—Bombay is supplied with the drug from Singapore. There is a good demand for it, and the consumption in native practice appears to be increasing. Value, 4 annas per lb. before the late rise in price, since which the price has ranged between 8 annas and one rupee.

Piper Betle, *Linn.*, *Rheede Hort. Mal. vii.*, *t.* 15; *Bot. Mag.*, *t.* 3132; *Vern.*—Tambula (*Sans.*), Pán (*Hind.*, *Beng.* and *Bomb.*), Vettilei (*Tam.*) The following concise and excellent notice is extracted *verbatim* from Dutt's Hindu Materia Medica:—"The leaves of this creeper are, as is well known, masticated by the natives of India. The poorer classes make their packet of betel with the addition of lime, catechu, and betel-nuts. The rich add cardamoms, nutmegs, cloves, camphor, and other aromatics, Betel-leaf thus chewed acts as a gentle stimulant and exhilarant. Those accustomed to its use feel a sense of langour when deprived of it. The ancient Hindu writers recommend that betel-leaf should be taken early in the morning, after meals and at bed-time. According to Susruta, it is aromatic, carminative, stimulant, and astringent. It sweetens the breath, improves the voice, and removes all foulness from the mouth. According to other writers it acts as an aphrodisiac. Medicinally it is said to be useful in diseases supposed to be caused by deranged phlegm, and its juice is much used as an adjunct to pills administered in these diseases, the pills being rubbed into an emulsion with the juice of the betel-leaf and licked up. Being always at hand, *pan* leaves are used as a domestic remedy in various ways. The stalk of the leaf smeared with oil is introduced into the rectum in constipation and tympanitis of children, with the object of inducing the bowels to act. The leaves are applied to the temples in headache for relieving pain, to painful and swollen glands for promoting absorption, and to the mammary gland with the object of checking the secretion of milk. Pan leaves are used as a ready dressing for foul ulcers, which seem to improve under them." (*Op. cit.*, p. 244.) They are the *Tambul* of Ibn Sina and other Arabian writers. In the Concan the fruit with honey has a reputation as a remedy for cough.

Description.—The leaves are about five inches long, broadly ovate, acuminate, obliquely cordate at the base, 5 to 7 nerved, coriaceous, and glossy on the upper surface : they have a burning, aromatic and bitter taste. D. S. Kemp (1885) by distilling the fresh leaves with water obtained two pale yellow essential oils, one heavy and the other light, both having the peculiar odour of the leaf, but the light being most aromatic.

Lendi-pipli. Globular catkins of a species of pepper occasionally found in the Bombay market, said to come from Singapore. They are of the size of the pellets of sheep's dung, hence the name Lendí-píplí. The taste is very hot and acrid. The individual fruits are nearly as large as cardamom seeds, the whole catkin having much the appearance of a small blackberry.

CUPULIFERÆ.

Quercus infectoria, *Oliver, Bentl. and Trim., t.* 249. The galls.

Vernacular.—Mázúphal, Máphal (*Hind.*), Májuphal (*Beng.*), Maiphal, Mája (*Bomb.*), Mashik-kai (*Tam.*)

History, Uses, &c.—The Indian names for galls appear to be derived from the Persian Mazú, and indicate their Western origin. Galls were well known to the Greeks and Romans, who used them medicinally on account of their astringent properties.* India has probably been supplied with them from an early date, *viâ* the Persian Gulf, the greater portion being shipped at Basra on board Arab vessels, hence the names Basra and Maka galls. The medicinal uses to which galls are put in India hardly differ from those with which we are familiar. The Hindus divide them into two kinds, black and white, and generally prescribe both kinds together in the same prescription. Mahometan writers direct the dark-coloured unperforated galls to be selected as the best.

Description.—Two kinds of gall are found upon Oak trees, hard and soft; the former are the galls of commerce, and are produced by a Cynips which punctures the buds of the tree and deposits its egg in the puncture; the latter result from the puncture of an aphis.

Gall-nuts are globular or pyriform bodies, studded with numerous tuberosities, those which still contain the insect are of a blackish or bluish-green colour and heavy; those from which the insect has escaped are of much lighter colour, generally yellowish-white, on one side a round hole may be perceived; they are also lighter in weight and less astringent. When a gall is cut in two a round cavity is seen in its centre, which may or may not be occupied by the insect; in the latter case a passage leads from the cavity to the exterior.

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* Compare with Dios. i., 127. περὶ κηκίδων; and Pliny 16, 6, and 34, 26.

Microscopic structure.—The contents of the central cavity if present are seen to consist of a starchy parenchyme destined to supply food to the larva. The walls of the cavity are formed of stone-cells. The bulk of the gall consists of cells arranged in a radiating manner, many of them containing colouring matter and tannin. Towards the exterior of the gall the cells contain dark-coloured chlorophyl; on the very surface the cells are small and thick-walled, and form a kind of rind.

Chemical composition.—The principal constituent of galls is tannin or tannic acid. The tannin of different plants possesses distinctive characters; that obtained from galls is known as gallo-tannic acid. It is identical with the tannin of Rhus coriaria, *L.* (sumach).

Galls affords from 60 to 70 per cent. of tannin, and a small quantity of gallic acid

Commerce.—Galls are imported from Basra and the Persian Gulf ports. Value, White, Rs. 10 per maund of 37½ lbs.; Blue, Rs. 17. Imports about 1,400 cwts. yearly.

Betula Bhojpattra, *Wall., Pl. As. Rar.* 2, 7, Bhurjapatra (*Sans.*), Bhujpatr (*Hind.*, *Beng.* and *Bomb.*) requires a brief notice, as the bark is much used all over the country for writing medicinal charms on, and is to be found in every druggist's shop. This bark is well known as the material upon which the ancient Sanskrit manuscripts of Northern India are written. Dr. Bühler in his account of a tour in Cashmere in search of Sanskrit manuscripts says:—"The Bhurja MSS. are written on specially prepared thin sheets of the inner bark of the Himalayan birch, and invariably in Sârada characters. The lines run always parallel to the narrow side of the leaf, and the MSS. present therefore the appearance of European books, not of Indian MSS., which owe their form to an imitation of the Talapatras. The Himalayas seems to contain an inexhaustible supply of birch-bark, which in Kásmîr and other hill countries is used both instead of paper by the shop-keepers in the bazars, and for lining the roofs of houses in order to make them water-tight. It is also exported to India, where in many places it is likewise used for wrapping up parcels, and plays an important part in the manufacture of the flexible pipe-stems used by hukâ-smokers. To give an idea of the quantities which are brought into Srinagar, I may mention that on one single day I counted fourteen large barges with birch-bark on the river, and that I have never moved about without seeing some boats laden with it. None of the boats carried, I should say, less than three or four tons weight.

" The use of birch-bark for literary purposes is attested by the earliest classical Sanskrit writers. Kalidâsa mentions it in his dramas and epics ; Susruta, Varahâmihira (circa 500-550 A. D.) know it likewise. Akbar introduced the manufacture of paper, and thus created an industry for which Kásmîr is now famous in India. From that time the use of birch-bark for the purpose of writing was discontinued, and the method of preparing it has been lost. The preparation of the ink which was used for Bhûrja MSS. is known. It was made by converting almonds into charcoal and boiling the coal thus obtained with gomûtra (urina bovis) ; this ink is not affected by damp or water." (Journal Bombay Branch Royal Asiatic Society, Vol XII., No. XXXIV. A.)

SALICINEÆ.

Salix caprea, *Linn., Eng. Bot.* 1488. The flowers.

Vernacular.—Bed-mushk (*Pers.* and *Hind.*) ; the distilled water, Má-el-khiláf (*Arab.*)

History, Uses, &c.—This species of willow is frequently mentioned in Persian books as a well-known popular remedy. In Arabic it is called Khiláf-el-Balkhí. The Persian settlers in India have introduced the flowers and distilled water, but they are only used by the better classes of Mahometans and Parsís. Mír Muhammad Husain describes Khíláf-i-Balkhí as cephalic and cardiacal, deobstruent and tonic; it is one of those popular domestic remedies which are used in almost every kind of slight ailment. Raughan-i-bed is a favourite remedy for cough, it is made by boiling two parts of the distilled water with one of sesamum oil until the water is all evaporated. The Arabic word Khiláf is equivalent to the Genus Salix, the ἰτέα of the Greeks. Two kinds are usually described in Persian books on Materia Medica—Bed-mushk and Bed-i-sádah or Bed-i-barí, the latter is called Safsáf in Arabic.

A description of S. caprea will be found in English Botanical works; it is one of those willows which yield salicine.

The bark of **Salix tetrasperma**, *Roxb., Cor. Pl.* 1, *t.* 97, indigenous in this part of India, appears to be quite inert. The bark has been examined by Sir W. O'Shaughnessy, who failed to detect any trace of salicine in it. (Pharm. Ind.)

URTICACEÆ.

Cannabis sativa, *Linn., Bentl. and Trim., t.* 231. The plant and resin.

Vernacular.—Flowering tops, Gánja (*Hind., Bomb.* and *Beng.*), Kalpam, Gánja (*Tam.*); leaves, Bháng, Siddhí, Sabzí (*Hind., Beng.* and *Bomb.*), Gánja-ilai, Bangi-ilai (*Tam.*); resin, Charas (*Hind., Beng.*, and *Bomb.*), Gánja-phal, Gánja-rasham (*Tam.*)

History, Uses, &c.—Cannabis has been in use as an intoxicating agent in the East from a very early period; whether its properties were first known in Persia or in India is difficult to decide, but the use of Bana for the purpose of procuring abortion is forbidden in the Sacred Books of the Parsís. In Hindu mythology the plant is said to have been produced, while the gods were churning the ocean with Mount Mandára. It is called in Sanskrit Vijaya (giving success), and the favourite drink of Indra is said to be prepared from it. On festive occasions large quantities are consumed by almost all classes of Hindus. The Brahmins sell sherbet prepared with bhang at the temples, religious mendicants collect together and smoke ganja. Shops for the sale of preparations of hemp are to be found in every town, and are much resorted to by the idle and vicious. A notice of hemp has been traced in the fifth chapter of Menu, where Brahmins are prohibited the use of Ganjera. In the Rajanighanta its synonyms are 'Vijáyá,' 'Ujáyá,' and 'Jáyá,' names which mean promoters of success; 'Vrijpatta,' the strong-leaved, 'Chapola,' the cause of a reeling gait, 'Ununda,' or the laughter moving, 'Hursíní,' the exciter of sexual desire. Its effects on man are described as excitant, heating, astringent; it destroys phlegm, expels flatulence, induces costiveness, sharpens the memory, excites appetite, &c. The Rajbulubha alludes to the use of hemp in gonorrhœa. Susruta recommends the use of bhang to people suffering from catarrh.

The notices of hemp in Arabic and Persian works are much more numerous. The oldest work in which it is noticed is a treatise by Hassan, who states that in the year 658 A.H., Sheikh Jafar Shirázi, a monk of the order of Haider, learned from his master the history of the discovery of hemp. Haidar lived in rigid privation on a mountain between Nishabor and Rama, where he established a monastery; after having lived ten years in this retreat, he one day returned from a stroll in the neighbourhood with an air of joy and gaiety; on being questioned, he stated that struck by the appearance of a plant he had gathered and eaten its leaves. He then led his companions to the spot, who all ate and were similarly excited. A tincture of the hemp leaf in wine or spirit seems to have been the favourite formula in which Sheikh Haidar indulged himself. An Arab poet sings of Haidar's emerald cup, an evident allusion to the rich green colour of the tincture. The Sheik survived the discovery ten years, and subsisted chiefly on this herb, and on his death his disciples at his desire planted it in an arbour round his tomb. From this saintly sepulchre the knowledge of the effects of hemp is stated to have spread into Khorasán. In Chaldea it was unknown until 728 A. H., the kings of Ormus and Bahrein then introduced it into Chaldea, Syria, Egypt and Turkey. In Khorasán, however, it seems that the date of the use of hemp is considered to be far prior to Haidar's era. Biraslan, an Indian pilgrim, is believed to have introduced it in the time of Cosroes. Makrízí mentions its use in Egypt, and states that oxymel and acids are antidotes to its narcotic effects; he describes its properties as diuretic, astringent, and aphrodisiac. Ibn Baitar was the first to record its tendency to produce mental derangement.

In 780 A. H., very severe ordinances were passed in Egypt against the use of hemp, those convicted were subjected to the extraction of their teeth, but in 799 A. H., the custom re-established itself with more than original vigour. (Confer. Bengal Dispensatory.)

The author of the Makhzan-el-Adwiya describes hemp under the Arabic name of Kinnab, which he says is supposed to be derived from the Persian Kanab; he gives Udifarúnas* as the Yunáni name, and Kanabira as the Syrian, and also mentions a number of cant terms which are applied to it, such as Wark-el-khyál, Hashish, Hashishat-el-fukará, Arsh-numá, Chatr-i-akh-zar, &c. Charas is described, and the practise of smoking it. The Bengal grown hemp is said to be less intoxicating than that grown in more northern climates. Hempseed is called in Persian Shahdánah. The leaves are made into sherbet and conserves for intoxicating purposes. The properties of hemp are described as cold and dry in the third degree, that is, stimulant and sedative, imparting at first a gentle reviving heat, and then a refrigerant effect, the drug at first exhilarates, improves the complexion, excites the imagination, increases the appetite, and acts as an aphrodisiac; afterwards its sedative effects are observed—if its use is persisted in it leads to indigestion, wasting of the body, melancholy, impotence and dropsy. With respect to other uses to which the drug may be put, the author of the Makhzan says:—"The leaves make a good snuff for deterging the brain, their juice applied to the head removes dandriff and vermin, dropped into the ear it allays pain and destroys worms, it checks the discharge in diarrhœa and gonorrhœa, and is diuretic." The powder of the leaves is recommended as an external application to fresh wounds and sores, and is used to promote granulation, a poultice of the whole plant is applied to local inflammations, erysipelas, neuralgia, &c. The dose of the leaves is one dirhem (48 grs.) when administered internally. (Makhzan, article "Kinnab.")

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* Some such word may have been manufactured by the Syrian monks in the Middle Ages, possibly from ἐῦ and διαφέρω as an equivalent to the Sanskrit 'Vijaya.'

Sir W. O'Shaughnessy in the Bengal Dispensatory informs us that Mirza Abdul Russac considers hemp to be a powerful exciter of the flow of bile, and relates cases of its efficacy in restoring appetite, of its utility as an external application as a poultice with milk in relieving hæmorrhoids, and internally in gonorrhœa, to the extent of a quarter drachm of bangh. He also furnishes the following data:—

"In the 35th chapter of the 5th volume of Rumphius' Herbarium Amboinense, p. 208, Ed. Amsterd., A. D. 1695, we find a long and very good account of this drug, illustrated by two excellent plates. The subjoined is an epitome of Rumphius' article:—

"Rumphius first describes botanically the male and female Hemp plants, of which he gives two admirable drawings. He assigns the upper provinces of India as its habitat, and states it to be cultivated in Java and Amboyna. He then notices very briefly the exciting effects ascribed to the leaf, and to mixtures thereof with spices, camphor, and opium. He alludes doubtingly to its alleged aphrodisiac powers, and states that the kind of mental excitement it produces depends on the temperament of the consumer. He quotes a passage from Galen, lib. I., (de aliment, facult), in which it is asserted that in that great writer's time it was customary to give hempseed to the guests at banquets, as a promoter of hilarity and enjoyment. Rumphius adds, that the Mahometans in his neighbourhood frequently sought for the male plant from his garden to be given to persons afflicted with virulent gonorrhœa or with asthma, and the affection which is popularly called 'stitches in the side.' He tells us, moreover, that the powdered leaves check diarrhœa, are stomachic, cure the malady named pitao, and moderate excessive secretion of bile. He mentions the use of hemp smoke as an enema in strangulated hernia, and of the leaves as an antidote to poisoning by orpiment. Lastly, he notices in the two subsequent chapters varieties of hemp, which he terms the Gunjah sativa and Gunjah agrestis."

In the Hortus Malabaricus, Rheede's article on the hemp is a mere outline of Rumphius' statements.

Among modern European writers, the only information we could trace on the medicinal use of hemp in Europe is in the recent work of Nees V. Esenbeck, from which the following is an extract kindly supplied by Dr. Wallich :—

" The fresh herb of the hemp has a very powerful and unpleasant narcotic smell, and is used in the East, in combination with opium, in the preparation of intoxicating potions, &c. It is probable that the nepenthe of the ancients was prepared from the leaves of this plant. Many physicians, Hahnemann among them, prescribe the vinous extract in various nervous disorders, where opium and hyoscyamus used to be employed, being less heating and devoid of bitterness.

" No information as to the medicinal effects of hemp exists in the standard works on Materia Medica, to which we have access. Soubeiran, Fée, Merat and De Lens in their admirable dictionary, Chevallier and Richard, Roques (Phytographie Medicale), Ratier and Henry (Pharmacopée Française), and the Dictionnaire de Sciences Médicales, are all equally silent on the subject.

" In the Journal de Pharmacie, the most complete magazine in existence on all pharmaceutical subjects, we find hemp noticed in several volumes. In the Bulletin de Pharmacie, t. v., a. 1810, p. 400, we find it briefly described by M. Rouyer, apothecary to Napoleon, and member of the Egyptian Scientific Commission, in a paper on the popular remedies of Egypt.

With the leaves and tops, he tells us, collected before ripening, the Egyptians prepare a conserve, which serves as the base of the *berch,* the *diasmouk,* and the *bernaouy.* Hemp leaves reduced to powder and incorporated with honey, or stirred with water, constitute the berch of the poor classes.

"The same work also (Bulletin, Vol. I., p. 523, A.D. 1809,) contains a very brief notice on the intoxicating preparations of hemp, read by M. De Sacy before the Institute of France in July, 1809. M. De Sacy's subsequent analysis of Makrizi, of which we have given an outline, is however much richer in details than the article in the Bulletin.

"In Ainslie's Materia Indica, 2nd Volume, we find three notices of the plant and its preparations.

"At page 39, 'Bhaghie' (Tamil), with the Persian and Hindee synonyms of 'Beng' and 'Subjee,' is described as an intoxicating liquor prepared with the leaves of the Gunjah or Hemp plant. Under the head Gunjah, Ainslie gives numerous synonyms, and tells us that the leaves are sometimes prescribed in cases of diarrhœa, and in conjunction with turmeric, onions, and warm gingelly oil are made into an unction for painful protruded piles. Dr. Ainslie also gives a brief view of the popular uses and botanical peculiarities of the plant.

"Majoon, lastly, is described by Dr. Ainslie, page 176, as a preparation of sugar, milk, ghee, poppy seeds, the seeds of the datura, powder of nux-vomica, and sugar. The true Majoon, however, as prepared in Bengal, contains neither datura nor nux-vomica. We have already described the process by which it has been manufactured before us." (Bengal Disp., p. 582.)

In Poona, a native beer, called "Bhoj," is brewed from jowaree grain malted, and bhang is added as a substitute for hops; this is drunk in large quantities, and is said to be a refreshing and innocuous drink.

The medicinal properties of Cannabis have now been investigated by many European physicians in India. O'Shaughnessy tried it with more or less success in various diseases, especially in tetanus, hydrophobia, rheumatism, the convulsions of children and cholera. Subsequent experience has confirmed the value of the drug as a remedy in tetanus and cholera. In the former disease I have myself obtained most satisfactory results, large doses are required, and the patient must be kept under the influence of the drug for some days.

In cholera its action may be compared with that of opium, it is most likely to be successful when resorted to early in the disease. People suffering from painful chronic diseases, such as rheumatism, are completely relieved of their pains by hemp, but as the effects of the drug go off the pains return; some of O'Shaughnessy's patients became cataleptic whilst under its influence. Christison, speaking of Indian Hemp, says:— "I have long been convinced, and new experience confirms the conviction, that for energy, certainty, and convenience, it is the next anodyne, hypnotic and antispasmodic, to opium and its derivatives, and often equal to it."

Description.—Bhang consists of the dried leaves, which are of a deep green colour and usually broken, so as to form a coarse powder; the odour is peculiar. The leaves have long petioles and are digitate, with linear-lanceolate, sharply serrated leaflets, tapering to a long smooth point.

Gánja is the name given to the flowering tops of the female plant. The flowers form erect clustered spikes, often 6 to 8 inches long; in the drug the spikes, are compressed, flat, glutinous, and of a brownish green colour; they have a peculiar narcotic odour.

Pure Charas is a greenish-brown, moist, resinous mass, having the peculiar odour of the plant, and consists of resin mixed with the hairs and fragments of the leaf. Bazar Charas varies much in quality, some specimens being only very partially soluble in spirit, friable, and of an earthy appearance. Sixty grains of the finest Yarkand Charas which I examined left after exhaustion with spirit only 13 grains of residue, chiefly hairs of the plant.

Chemical composition.—According to the Pharmacographia:— "The most interesting constituents of hemp, from a medical point of view, are the resin and volatile oil. The former was first obtained in a state of comparative purity by T. and H.

Smith in 1846. It is a brown, amorphous solid, burning with a bright white flame, and leaving no ash. It has a very potent action when taken internally, two-thirds of a grain acting as a powerful narcotic, and one grain producing complete intoxication. From the experiments of Messrs. Smith, it seems impossible to doubt that to this resin the energetic effects of Cannabis are mainly due.

"When water is repeatedly distilled from considerable quantities of hemp, fresh lots of the latter being used for each operation, a volatile oil lighter than water is obtained, together with ammonia. This oil, according to the observations of Personne (1857), is amber-coloured, and has an oppressive hemp-like smell. It sometimes deposits an abundance of small crystals. With due precautions it may be separated into two bodies, the one of which named by Personne *Cannabene,* is liquid and colourless, with the formula C^{18} H^{20}, the other, which is called *Hydride of Cannabene,* is a solid, separating from alcohol in platy crystals, to which Personne assigns the formula C^{18} H^{22}. He asserts that Cannabene has indubitably a physiological action, and even claims it as the sole active principle of hemp. Its vapour he states to produce when breathed, a singular sensation of shuddering, a desire of locomotion, followed by prostration and sometimes by syncope. Bohling, in 1840, observed similar effects from the oil, which he obtained from the fresh herb just after flowering, to the extent of 0·3 per cent.

"The other constituents of hemp are those commonly occurring in other plants. The leaves yield nearly 20 per cent. of ash.

"As to the resin of Indian hemp, Bolas and Francis, in treating it with nitric acid, converted it into *Oxycannabin,* C^{20} H^{20} N^{2} O^{7}. This interesting substance may, they say, be obtained in large prisms from a solution in methylic alcohol. It melts at 176° C., and then evaporates without decomposition; it is neutral." (Pharmacographia, p. 493.)

A few years ago, Preobraschensky (Pharm. Zeitsch. f. Russland, 1876, p. 705,) made a chemical examination of a quantity of haschisch which he brought with him from China, and was enabled, according to his own statement, to separate from it a volatile alkaloid, which he held to be identical with nicotine, and which he believed to be the active part of Cannabis. This, in view of the distinctive and very different action of Cannabis, was somewhat remarkable. It is highly probable, as has been suggested by Dragendorff and Marquiss (Pharm. Zeitung, 1877), that the haschisch used by Preobraschensky was mixed with tobacco, which it often is in Eastern countries.

Recently Louis Siebold and Bradbury have reported to the British Pharmaceutical Conference (1881) that, after an elaborate investigation, they have arrived at the conclusion of Dragendorff and Marquiss, and that in the course of their investigation they made the interesting discovery that pure Cannabis does actually contain a volatile alkaloid, which does not, however, possess the characters of nicotine. They separated it in very small quantity, obtaining not more than 2 grains from 10 lbs. of Indian hemp. They give it the name of cannabinine. They record no observations as to its physiological action; and they therefore leave it doubtful as to whether this volatile alkaloid is the narcotic principle of Cannabis.

A considerable time ago Dr. Hay commenced a chemical examination of the drug, the results, so far, of which lead him to believe that Cannabis Indica contains several alkaloids. He says:—"In a future communication I hope to be able to give an exact description of the distinctive characters and toxic action of each. In the meantime, I shall content myself with the description of one which I have obtained in a considerable degree of purity, and one which, rather remarkably, possesses an action similar to that of strychnia. It is evidently, therefore, quite a secondary alkaloid of the Cannabis, and reminds one of the thebaine of opium. This alkaloid was obtained from a watery infusion of powdered Cannabis indica by treating it with a solution of subacetate of lead, and filtering. To the filtrate was added ammonia, and the precipitate removed by filtration. The filtrate, acidulated with sulphuric acid, was now treated with a solution of phospho-wolframic acid in order to precipitate the alkaloids present. The precipitate, which was fairly abundant, was, after the fluid had been removed by filtration and washing with dilute sulphuric acid and pressing, mixed with barium hydrate and water, which formed an insoluble wolframate and set free the alkaloids. The filtrate was now deprived of its excess of barium by means of a stream of carbonic acid gas and again filtered. The filtrate was at a gentle heat evaporated almost to dryness and acidulated with sulphuric acid, and treated with absolute alcohol. The sulphate of the alkaloids thus formed was partially soluble in alcohol, partly not. It was from the soluble part that the alkaloid in question was procured. The sulphate was converted into a chloride by treatment with barium hydrate, afterwards with carbonic acid to remove excess of barium, and, finally, with hydrochloric acid to neutralization. The chloride was evaporated and treated with absolute alcohol, in which it in part dissolved. From the solution, by addition of excess of carbonate of soda and frequent shaking with ether, an alkaloid was obtained in the form of colourless needle-like crystals.

"The alkaloid was easily soluble in water, soluble also in alcohol, and more slowly soluble in ether and chloroform. It caused tetanus in frogs in exactly the same manner as strychnia, increasing the excitability of the reflex centres of the spinal cord. It did not give a violet colour with sulphuric acid and bichromate of potash. It was, therefore, although similar in action to strychnia, not chemically identical with it. A solution of it in water was precipitated by the various alkaloidal precipitants, platinic chloride, iodide of potassium and mercury, phosphotungate of soda, phosphomolybdic acid, phosphowolframic acid, &c. Although I obtained the alkaloid from 1 kilo. of Cannabis, yet the quantity of it was so small, that it was insufficient for an elementary analysis.

"To this alkaloid I propose to give the name of *tetano-cannabine*, as indicative of its action."

The Tannate of Cannabin of Merck, a glucoside contained in Indian Hemp, which he has combined with tannin, is a yellowish-brown powder, with a taste of Tannin, and a rather agreeable odour; it is insoluble in water and ether, and only slightly soluble in alcohol; in alkaline solutions it dissolves readily. This substance is said to be free from any admixture of the volatile alkaloid of Cannabis indica, it does not produce intoxication, and is used as a hypnotic; it is said not to derange the digestive and secretory organs like opium, and to be especially valuable in irritable states of the nervous system. Eight grains is the dose for an adult. Recently (1884), Warden and Waddell of Calcutta, although operating on a large quantity of Indian Hemp of ascertained activity, were unable to find any evidence of the existence of such a principle as Dr. Hay describes. They further remark that:—"As many of those addicted to the Hachish form of intemperance obtain the intoxicating effects by smoking the plant in a pipe; it is to be expected that destructive distillation of the freshly prepared resin might yield up the active principle. This process was therefore resorted to. By the destructive distillation of freshly prepared alcoholic extract of the plant to which an excess of caustic potash solution had been added, an amber coloured oil was obtained, which by exposure to the air or the action of alkalies rapidly became of a dark reddish-brown colour. This oil had a mildly empyrheumatic odour which was distinctly tobacco-like. Its taste was warm, aromatic and somewhat terebinthinate. The oil contained phenol, ammonia and several other of the usual products of destructive distillation.

"The nicotine-like principle contained in this oil appeared to be an alkaloid. It formed salts which evolved a strong nicotine-like odour when acted on by alkalies. But physiologically it was found to be inert, and therefore was evidently not identical with nicotine.

"The oil as a whole was also found to be devoid of any narcotic or irritant qualities. About ⅛th of an ounce was introduced into the stomach of a cat without producing any sensible effect. These results do not coincide with those of Personne, who asserted that the active principle of the plant resided in the volatile oil. It is just possible that the active principle was decomposed by the high temperature necessary for destructive distillation." (*Ind. Med. Gaz.*, Dec. 1884.)

Commerce.—Bombay is supplied with Gánja and Bhang from the districts east of Ahmadnagar, the Balaghat, &c. The culture of the plant is a regular art, and Bhang doctors travel about to give their services in pruning the plants or nipping off the superfluous buds.

Charas is imported from Northern India, Afghanistan, and Yarkand. Value, commercial, Re. 1 per lb.; pure Yarkand, nominal.

Ganja, Rs. 30 to Rs. 40 per gantha of three Bombay maunds (104 lbs.)

Bhang, Rs. 2 per maund of 28 lbs.

Ficus religiosa, *Linn.*, *Rheede Hort. Mal. i.*, *t.* 27; *Pluk. Alm.*, *t.* 178, *f.* 2; Asvattha (*Sans*), Pípal (*Hind.* and *Bomb.*), Arasammaram (*Tam.*), is a sacred tree of the Hindus, and may be seen in all parts of the country, especially near temples, wells, and villages; it is said that Vishnu was born among its branches; to cut or mutilate the tree is considered a crime by people of the higher castes; medicinally the powdered root-bark with honey is applied to aphthous sores, ulcers, &c., to promote cicatrization.

Anislie tells us that the seeds are supposed to possess cooling and alterative qualities. Bartolomeo in his voyage to the East Indies says that the dried fruit pulverised and taken in water for fourteen days together removes asthma, and promotes fruitfulness in women. According to Wight the leaves and young shoots are purgative. The root-bark along with that of F. Bengalensis, F. glomerata, F. infectoria and Azdarachta indica is an ingredient in a combination which is known in Sanskrit as Panchavalkala, or the five barks. It has astringent properties.

Ficus glomerata, *Roxb., Cor. Pl.* 2, *t.* 123; *Vern.*—Udumbara (*Sans.*), Guler (*Hind.*), Jagnodumar (*Beng.*), Umbar (*Bomb.*) has an astringent bark; this as well as the fruit, which is considered to have similar properties, is prescribed in hæmaturia, menorrhagia and hæmoptysis. The dose is about 200 grains. The fruit filled with sugar is considered to be very cooling, and the small blister-like galls which are common on the leaves soaked in milk and mixed with honey are given to prevent pitting in small-pox. Ainslie tells us, "that from the root of the tree, which in Tamil is called attievayr, there exudes, on its being cut, a fluid which is caught in earthen pots, and which the Vytians considers as a Cúlpám (*Tam.*), that is, a powerful tonic, when drank for several days together. This Cúlpám is termed attie-vayr tannie." (Mat Ind. II., p. 30.) In Bombay the sap is a popular remedy, which is locally applied to mumps and other inflammatory glandular enlargements,* and is given in doses of four tolás with cummin and sugar for gonorrhœa.

Ficus cordifolia *Roxb.*

Vernacular.—Ashta, Pair (*Mar.*)

Description, Uses, &c.—A tree having much the appearance of the Pipal; leaves on very long petioles (6 to 8 in.) broad-cordate, with a short and sudden acumination, rather membranaceous with waved margins, finely reticulated beneath, perfectly smooth; fruit paired, sessile, round, smooth, black, of the size and appearance of a black cherry. The juice is used in the Concan to kill worms, and is given internally with turmeric, pepper and ghí, in pills, the size of a pea, for the relief of asthma; it causes vomiting. The juice is also burned in a closed vessel with the flowers of Mudar, and four gunjás' weight of the ashes mixed with honey is given for the same purpose.

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* It is interesting to note that the juice of the F. sycomorus, *Linn.*, the *συκομόρος* of Dioscorides, and the جمّيز (Jumíz) of the Arabs, was used by the Greeks, and is still used in Egypt for a similar purpose, and that both trees have much the same habit. (Conf. Dios. i., 148, and Prosper Alpinus, p. 20.) In the Makhzan Guler is given as the Hindi for Jumíz.

Ficus hispida, *Linn f., Wight Ic., t.* 641 ; *Vern.*—Bokhera, Gándaumbar (*Bomb.*), has been brought to notice by Mr. M. Sheriff on account of its emetic properties. The shrub is common in Bombay; it has opposite, cuneate, oblong leaves, which are scabrous above and downy beneath. The fruit is like a small fig and very hairy ; it usually grows from the stem near or beneath the ground. In Bombay and the Concan the powdered fruit heated with a little water is made into a *lép* or poultice which is applied to buboes, which it either disperses or brings rapidly to maturity. The fruit is also given to milch-cattle to dry up their milk.

Ficus bengalensis, *Linn., Rheede Hort. Mal. i., t.* 28; *Vern.*—Vata (*Sans.*), Bar (*Hind.*), War (*Bomb.*), Ala-maram (*Tam.*), is the well known Banyan tree. The seeds of the fruit are considered cooling and tonic. The white glutinous juice is applied as a remedy for toothache, and to the soles of the feet when cracked and inflamed. The bark is given as a tonic. The leaves after they have turned yellow are given with roasted rice in decoction as a diaphoretic; dose 3 leaves.

Ficus Carica, *Linn., Bentl. and Trim. t.* 228 ; *Vern.*—Anjír (*Hind.* and *Bomb.*), Dumur (*Beng.*), Tén-atti (*Tam.*), is cultivated in India, but does not produce fine fruit. Bombay is supplied with dried figs of inferior quality from Arabia and Persia. Figs are the συκα of Dioscorides (i., 149,) and the Ficus of the Romans.

Ficus retusa, *Linn., Wight Ic.,* 642.
Vern.—Nandruk (*Mar.*)
In rheumatic headache the leaves and bark pounded are applied as a poultice. In flatulent colic the following pre-

scription is used in the Concan :—Take of Nandruk leaf-juice, Tulsi leaf-juice, and ghí, equal parts; boil until all the water has evaporated; do this again 21 times with fresh quantities of the juice of the two plants; the residuum may then be applied to the belly, and fomentation with a hot brick be practised. Rheede notices a similar use of the plant. (Hort. Mal. III., t. 55.) The juice of the bark has a reputation in liver disease; dose 1 tolá in milk.

Ficus asperrima, *Roxb.*, *Wight Ic.*, *t.* 633.

Vern.—Kharoti, Khoréti, Karwat (*Bomb.*)

A tree, common in Bombay, with ovate, alternate, very rough leaves of a pale green colour, at the apex of the petiole and in the axils of the leaf veins there are small shining green glands as in F. hispida, except that the glands are more completely in axils, and appear closed, whereas in the latter plant they have a distinct stoma. The leaves are so rough from the presence of calcareous hairs that they are used to polish wood instead of sand paper. Both the juice of the plant and the bark are well known remedies for glandular enlargements of the abdomen, such as liver and spleen. The bark is brown, scabrous and has sweetish, astringent taste. According Graham, T. oppositifolia, now 'hispida,' is named Karwat, but this is contrary to my experience.

Urostigma volubile, *Dalz. Vernacular*—Datír. The root-bark is considered stomachic and gently aperient.

Description.—A climbing shrub, and often a tree with a stem as thick as a man's arm; leaves alternate, very shortly petioled, somewhat ovate, suddenly acuminated, very unequally sided, cuneate toward the base; lateral nerves 3 to 4 on each side, prominent, spreading, uniting in arches, pale-green, hard, length 3 to 4 inches, sometimes a little toothed on the margin; fruit small.

Antiaris toxicaria, *Leesch., Wight Ic.,* 1958.

Vernacular.—Rukha, Chándala, Chánda-kuda, (*Bomb.*), Juzúgrí, Chándala (*Can.*), Alli, Nattavil (*Tam.*). The nuts are subglobular, the size of a marble, of a light-brown colour, and have a slightly prominent umbilicus; they are enclosed in a sweet greenish-yellow pulp, forming a small one-seeded fig with a rich purple bloom. The shell is thin and fragile, the kernel, loose inside the shell, is of the size of a large pea, brown, sub-globular, rugose, especially upon the flatter side; substance hard and very bitter. A third or fourth part of a kernel is given in colic, dysentery and diarrhœa once or twice a day. Nimmo, in Graham's Flora, notices the bitterness of the seeds, and states that they contain an azotised principle. Further information on the medicinal properties of the seed is much required.

Chemical composition.—When the sap of the tree is exhausted with boiling alcohol, a mixture of vegetable albumin, gum and wax remains undissolved, while a solution is formed, which throws down, on cooling, wax, antiar-resin, and albumin. On removing the sediment and evaporating, more resin and wax are deposited, and the solution dries up at last to an extract from a solution of which in boiling water *Antiarin*, $C_{28} H_{20} O_{10}$, amounting to 3·5 per cent. of the dried sap, crystallises. The crystals are purified by washing and recrystallisation. With 4 at. water Antiarin forms splendid silvery laminæ resembling malate of lime.

The flakes which separate from the alcohol after boiling it with the sap of A. toxicaria, consist of *Antiar-resin*, $C_{32} H_{24} O_2$, which may be obtained white by re-solution in boiling alcohol; when dry it has a glassy fracture, but becomes pasty if warmed. It is not poisonous, whilst Antiarin causes death if introduced into the circulation in minute portions. (Mulder in Gmelin's Handbook, Vol. XVI., p. 217.) The seeds of A. toxicaria powdered and treated by me in the manner above mentioned yielded a resin, but no trace of crystalline matter; it is therefore probable that their medicinal properties are due to the presence of Antiar-resin.

Ulmus integrifolia, *Willd.*, *Wight Ic.*, *t.* 1968.

Vernacular.—Vávaḷá (*Mar.*), Páprí (*Hind.*)

A large tree, leaves deciduous in October; it flowers in February and March, at which period the young leaves begin to appear. In the Concan the juice of the bark is boiled and applied to rheumatic swellings, the exhausted bark is then powdered and applied over the parts covered by the sticky juice.

Celtis dysodoxylon, *Thwaites.*

Vernacular.—Gúranda (*Ceyl.*), Narakya-úd, *Anglice*, Hell's Incense (*Bomb.*), Poodacarapan (*Tam.*)

Description, Uses, &c.—This is a light brown wood, having a penetrating odour exactly similar to that of fresh human ordure; it is sold by all the Bombay druggists, and is burnt as a fumigatory to drive away evil spirits. It comes from Ceylon, where Thunberg says:—" The tree was called by the Dutch Strunt-hout and by the Cingalese Urenne, on account of its disgusting odour, which resides especially in the thick stem and the larger branches. The smell of it so perfectly resembles that of human ordure, that one cannot perceive the smallest difference between them. When the tree is rasped and the raspings are sprinkled with water the stench is quite intolerable. It is nevertheless taken internally by the Cingalese as an efficacious remedy. When scraped fine and mixed with lemon juice it is taken internally as a purifier of the blood in itch and other cutaneous eruptions, the body being at the same time anointed with it externally." (Thunberg's Travels, IV., 234.)

Thunberg obtained leaves and young plants of the tree but no blossoms; the plants were all killed by cold in the English Channel. He states that it is not the Anagyris fœtida or the Sterculia fœtida.

Mr. J. Alexander of Ceylon states that a piece of the bark, hung up near a dwelling house, is used as a charm to drive away evil spirits.

The peculiar odour is probably due to the presence of *napthylamine.* The price of the wood in Bombay is Rs. 30 per candy of 7½ cwts. The Portuguese call it Pao de merda and Pao sujo.

Artocarpus Lakoocha, *Roxb.*

Vernacular.—Badhal or Barhal (*Hind.*), Votamba (*Mar.*) A few of these trees are to be found cultivated in Salsette. The tree is common in Bengal, where one or two seeds or a small quantity of the milk is popular as a purge. The Sanskrit name is Dahu, the Bengali Mádár.

Artocarpus integrifolia, *Linn., Roxb. Cor. Pl.* 3, *t.* 250; *Bot. Mag, tt.* 2833, 34.

Vernacular.—Kathal (*Hind.*), Phanas (*Bomb.*), Pila (*Tam.*) It does not appear to be generally known that the juice of the Jack tree heated over the fire is a valuable cement for joining broken China and stoneware. In the Concan one tolá of the bark-juice with an equal quantity of Mango-bark-juice is given with lime water in melæna, and the young leaves of Kápa-Phanas are used as a *lép* for sprains. The juice of A. hirsuta, *Lam., Vern.*—Phansula and Ránphanas, is applied in Pínash (ozæna).

MYRICACEÆ.

Myrica sapida, *Wall., Tent. Flor. Nep., p.* 59, *t.* 45. The bark.

Vernacular.—Kaiphal (*Hind., Bomb.* and *Beng.*), Marudampattai (*Tam.*)

History, Uses, &c.—This is the Katphala of Sanskrit writers, who describe it as hot and stimulant, and recommend it in catarrh and affections of the chest. It is also used by the Hindus mixed with ginger as an external stimulant application in cholera, &c. Under the names of Dár-shishaán, Kandúl, and Ùd-el-bark, Mahometan writers tell us that the bark is resolvent, astringent, carminative, and tonic; that it cures catarrh and headaches; with cinnamon they prescribe it for chronic cough, fever, piles, &c. Compounded with vinegar it strengthens the gums and cures toothache; an oil prepared from it is dropped into the ears in earache. A decoction is a valuable remedy in asthma, diarrhœa and diuresis; powdered or in the form of lotion the bark is applied to putrid sores; pessaries made of it promote uterine action. The usual dose for internal adminis tration is about 60 grains. Duhn-el-kandúl, an oil prepared from the flowers, is said to have much the same properties as the bark.

Description.—Bark half an inch thick, externally scabrous, pitted from the separation of pieces of suber, of a mottled rusty-brown and dirty white colour, suber warty; substance of bark and inner surface of a deep dull red colour; when soaked in water it produces a deep red solution; taste strongly astringent.

Microscopic structure.—Within the suberous layer is a remarkable stratum of stony cells; the parenchyma throughout is loaded with red colouring matter, and permeated by large laticiferous vessels, from which a gummy latex exudes when the bark is soaked in water.

Chemical composition.—No examination has been made. The bark yields its colouring matter freely to water and alcohol; water also extracts the gum. The watery extract evaporated to dryness yields a brittle highly astringent kino-like substance.

Commerce.—The bark comes from Northern India. Value, Re. 1 to Rs. 2 per maund of 41 lbs. About 50 tons are collected annually in the Kumaon forests.

Casuarina equisetifolia, *Forster, Lam. Ill., t.* 746, Wiláyatí-Sarú (*Bomb.*), is an Arracan and Malayan tree, which has been introduced into India, and is now very common about Bombay.

The bark, according to Dr. Gibson, is an excellent astringent, and may be used with advantage in chronic diarrhœa and dysentery. It is not used medicinally by the natives. The Chinese in Bombay say that it is used as an astringent in China.

Description.—Bark never very thick, brittle, breaking with a coarse fibrous fracture, substance very hard, fibrous, and of a pink colour ; internal surface striated ; external surface covered with a scabrous grey suber, readily separating in flakes, and displaying a thin brown suberous layer closely adhering to the liber ; taste strongly astringent ; odour not peculiar.

SANTALACEÆ.

Santalum album, *Linn.*, *Bentl. and Trim.*, *t.* 252. The wood and oil.

Vernacular.—Chandan (*Hind.*, *Beng.* and *Bomb.*), Shandanakkattai (*Tam.*)

History, Uses, &c.—Sankrit writers make two kinds of true Sandalwood, the darker heartwood, they call Pitachandana or yellow Sandal, and the lighter wood Srikhanda, or white Sandal. The wood and the essential oil are held in great esteem by the Hindus, partly on account of their medicinal qualities and partly from their every-day use in religious ceremony, and as a perfume. Chandana is mentioned in the Nirukta, or writings of Yaska, the oldest Vedic commentary extant, written not later than the 5th century B.C. It is also referred to in the ancient epic poems of the Hindus, the Ramayana and Mahabharata.

Chakradatta describes Sandalwood as bitter, cooling, astringent and useful in bilious fever and heat of body ; a paste of the wood is directed to be applied externally to inflammatory affections of the skin. This external use of the wood is extremely common among the Hindus ; in short, it is a domestic remedy for all kinds of pains and aches. Arrian in the Periplus (A.D. 124) mentions *Ξύλα σαγαλίνα* among the Indian imports into Oman in the Persian Gulf. Mahometan writers call the wood Sandal, and follow the Hindus in distinguishing the dark-coloured portion from the light. The author of the Makhzan describes it as cold and dry, cardiacal, tonic, astringent, alexipharmic, anti-aphrodisiac, a resolvent of inflammatory swellings, &c. He recommends an emulsion in bilious fever on account of its cooling and protective influence over the heart, brain, stomach, &c. As an external application a paste made with rosewater and camphor or with sarcocolla, and white of egg may be applied to relieve headache or to any kind of inflammatory swelling or skin affection. Sometimes the paste is made with the juices of herbs, such as purslain, nightshade, &c. Ainslie informs us that in Southern India Sandalwood given with milk is regarded as a valuable remedy in gonorrhœa. Rumphius mentions a similar use of it at Amboyna. (Amb., tom. II., p. 42.) In the Concan Sandalwood oil with Cardamoms and Bamboo manna is given in gonorrhœa, and mixed with limejuice and camphor it is used as a cooling application to eruptions, &c. A conserve of Sandalwood is also made by boiling the wood cut in small pieces in Bangar-khár* and water (4 seers Sandal, half a seer Bangar-khár, and 32 seers water) until it is quite soft. It is then preserved in a thick syrup. In the Pharmacopœia of India, Dr. Æ. Ross is stated to have subjected the wood to trial, and found that whilst its effects as a stimulant were very slight, its secondary effect was that of a sedative on the circulation. In remittent fevers in which it was administered, it acted as a diaphoretic, diminishing at the same time the rapidity rather than the violence of the heart's action. Dr. Henderson, of Glasgow, has directed the attention of European physicians to the valuable properties of oil of Sandalwood as a remedy for gonorrhœa, in doses of from 30 to 40 minims three times a day, and there is now some demand for it in India for this purpose.

Description and preparation of Oil.—The following memorandum by Dr. G. Bidie on Sandalwood, and the mode of extraction of its volatile oil, is of special interest and value, as being the result of personal observation:—

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* Impure carbonate of potash.

"The Santalum album is a small tree, rarely exceeding 25 feet in height and very limited in its range, being most abundant in the Mysore country, where it grows on the eastern slopes of the Western Ghauts, just beyond the limits of the Mulnaad, or rain country. It is carefully protected by Government, and only the trees that have reached maturity, which they do in from 18 to 25 years, are cut down. The felling takes place in the end of the year, and the trees, are then stripped of their bark and conveyed to various depôts, where they are cut into billets, which are carefully dressed and sorted according to the quality of the wood. These billets form the Sandalwood of commerce, and are sold by weight at an annual auction, native merchants congregating from all parts of India to make purchases. The pieces that are straight and have most heartwood fetch the highest price, as the fragrance for which they are so much prized depends on the presence of essential oil, which is chiefly situated in the dark central wood of the tree. The Mysore Government has long had establishments for extracting the oil, which is sold at the annual auction along with the wood, and chiefly bought up for exportation to China and Arabia. It is procured from the wood by distillation, the roots yielding the largest quantity and finest quality of oil. The body of the still is a large globular clay pot with a circular mouth, and is about 2½ feet deep by 6½ in circumference at the bilge. No capital is used, but the mouth of the still when charged is closed with a clay lid having a small hole in its centre, through which a bent copper tube about 5½ feet long is passed for the escape of the vapour. The lower end of the tube is conveyed inside a copper receiver, placed in a large porous vessel containing cold water. When preparing the Sandal for distillation the white or sap wood is rejected, and the heartwood is cut into small chips, and distillation is slowly carried on for ten days and nights, by which time the whole of the oil is extracted. As the water from time to time gets low in the still, fresh supplies are added from the heated contents of the refrigeratory. The quantity of oil yielded by wood of good quality is at the rate of 10 ozs. per maund, or 2·5 per cent. It is transparent and of a pale yellow colour, and has a resinous taste and sweet peculiar smell, which is best appreciated by rubbing a few drops of the oil on the warm hand. Its specific gravity is about 0·980."

Chemical composition.—"The wood yields about 2 per cent. of essential oil. It is a sherry-coloured thickish fluid, having a very persistent odour. According to the Pharmacographia, the sp. gr. is 0·963. The wood treated with boiling alcohol yields about 7 per cent. of a blackish extract, from which a tannate was precipitated by alcoholic solution of acetate of lead. Decomposed by sulphuretted hydrogen, the tannate yielded a tannic acid having but little colour, and striking a greenish hue with a ferric salt. The extract also contained a dark resin." (*Op. cit.*, p. 544.)

Commerce.—Bombay imports annually from 700 to 800 tons of Sandalwood from the Malabar Coast, and about 12,000 lbs. of the oil. When we consider that comparatively poor people often expend as much as Rs. 50 worth of Sandalwood at a cremation, it becomes evident that the whole of the 700 to 800 tons must be required for the supply of Western India. Sandalwood is sold by weight at from Rs. 120 to Rs. 180 per kandy of 21 maunds (5¼ cwts.), the heavy deep-coloured heartwood being most valuable. The oil is worth Rs. 8½ per lb., and is chiefly used as a perfume.

LORANTHACEÆ.

Kismish-i-Káwalíyán,[*] or **Muizak-i-asli,** is the name of a small, shrivelled, soft fruit imported from Persia; it is called Dibk and Kasús in Arabic, and appears to be the berry of some species of Viscum. The hakím Dáwúd says (in a passage which is imperfect in the Táj el Arús) "it is found upon the tree in like manner as lichen (الشّيبة), but is a berry, like the chickpea (حمّص) in roundness; . . . . the best thereof is the smooth, soft, with much moisture, inclining, in its exterior, to greenness, and it is mostly found upon the oak; when it is cooked with honey and دبس (juice of fresh dates, &c.,) . . . . and drawn out into longish strings, and put upon trees, the birds become caught by it." (Madd el Kámús.) The author of the Makhzan-el-Adwiya has the following account of it:—"A berry smaller than the seed of Cicer arietinum, green when fresh, but when dry shrivelled and of a brown colour, the contents are moist and viscid, the seeds about the size of poppy-seeds. The plant is parasitic upon the pear and other trees, and consists of several branches, the leaves are like those of the pomegranate, and of a pale green. Properties resolvent and laxative, a solvent of corrupt humours which it withdraws from the system. When steeped in hot water, strained, and beaten up with the kernels of the walnut or castor oil (which is the usual form of administration), it clears the system of adust bile and phlegm, removes obstructions, and is a remedy for lumbago, piles, &c. Applied externally it promotes the suppuration, or causes the dispersion of tumours or enlargements.* Sportsmen use it as birdlime, and dyers as a mordant for crimson."

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[*] Káwali or Kauli is the name of a gipsy tribe in Persia. Baron C. A. de Bode in his travels in Luristan and Arabistan (Vol. II., pp. 98—103) mentions his being shown in the forests of the Zagros mountains, on the road from Kirmanshah to Baghdad, a fruit called by the natives Angur-i-Kauli, or grapes of the Kauli, which grow on the oak, of a yellowish transparent colour, sometmes used as glue.

Birdlime and mistletoe are still called Dibk in modern Arabic. In Europe the young twigs and leaves of mistletoe have long been used in medicine for various nervous affections, including chorea, asthma, and spasmodic colic, but chiefly for epilepsy, although sometimes for hysteria. (Richter, Ausf. Arzneim, ii., 822.) Long (New Preparations, 1878,) used mitletoe in the forms of infusion, tincture, decoction and fluid extract in many cases of menorrhagia and post-partum hæmorrhage with gratifying results. He conceived that it incited the natural, rather than the tonic, contraction of the uterus.

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* Dioscorides gives an exactly similar account of the medicinal properties of Birdlime, ἰξός, the Viscum of the Romans.

A physician in South Carolina refers to three cases of abortion in negroes produced by this plant. (Med. Rec. xvii., 276; Stillé and Maisch., Nat. Disp., 1884, p. 1617.) Dr. R. Park speaks of a tincture of Viscum album as a valuable substitute for Digitalis; the ecbolic action of the plant, he says, is more energetic than that of ergot. Dose 10—60 grains.

Bandakpushp. Under this name the flowers of Loranthus longiflorus have been received from Poona as medicinal; they have a reputation among the Hindus as a remedy in consumption, asthma and mania.

CONIFERÆ.

Pinus longifolia, *Roxb., Lamb. Pin., t.* 21. The wood and turpentine.

Vernacular.—Saral, Chír (*Hind.*); the Turpentine, Gandah-birozah (*Hind.* and *Bomb.*)

History, Uses, &c.—The wood, in Sanskrit Sarala, and the turpentine Sarala-drava, are mentioned as medicinal in Sanskrit works; plasters, ointments, and pastiles for fumigations are directed to be made from the turpentine. The latter under the name of Gandah-birozah is found in all the Indian bazars, and appears to have all the properties of ordinary turpentine, though differing from it in odour. It is chiefly used as a pectoral plaster like the pitch plaster of Europe, but it has also a reputation in veterinary practice as a remedy for mange. The *Vaids* obtain from it by distillation without water a limpid sherry-coloured oil having the peculiar odour of the drug, which they call Khanno oil in the Deccan; it is in much repute as a remedy for gleet or long-standing gonorrhœa.

Collection.—The Chir Pine, which is a large tree of Afghanistan and the Northwest Himalayás, is the chief source of this turpentine. Atkinson, who describes its collection in Gurhwal and Kumaon, says that it is there called Birja and Lisha or Lassa,* and that there are two kinds collected, viz., the *natural exudation* and *Bakhar-birja*,† which is obtained by making incisions in the sap-wood. The yield of a tree thus treated is said to be from 10 to 20 lbs. the first year, and about one-third the quantity the second year, after which the tree either dies or is blown down. (Atkinson, Brandis.)

Description.—Gandah-birozah is a dirty-white opaque substance, of soft and sticky consistence, having a strong and peculiar odour, more aromatic than that of common turpentine; the leaves of some tree, which have evidently been used in collecting the turpentine, are usually found mixed with it in considerable quantity.

Chemical composition.—56 lbs. of the crude drug distilled with water yielded 8 lbs. of a colourless limpid oil, having the peculiar odour of Gandah-birozah. The resin remaining in the still was of a dull brown colour; after straining to remove impurities it was stirred with a small quantity of boiling water until hard, and afforded a very fair substitute for Burgundy Pitch, weighing 43 lbs.

The oil, according to Lyon, has a specific gravity of 875 at 82° F., it commences to boil at about 310° F., and is dextro-rotatory.

Commerce.—Gandah-birozah comes to Bombay in tins, containing about 82 pounds. It is sold for Rs. 6 to Rs. 6½ per maund of 41 lbs.

Cedrus Deodara, *Loudon* (*cum. fig.*), Devadáru (*Sans.*), Deodár (*Hind.*, *Bomb.* and *Beng.*), is considered carminative, diaphoretic, diuretic, and useful in fever, flatulence, inflammation, dropsy, and urinary diseases. The wood is sold in the druggists' shops, it is very heavy, and contains so much turpentine that thin fragments of it are translucent. The turpentine, Kilan-ka-tel, is used as an alterative in leprosy and chronic skin diseases. (Confer. Phar. of India, p. 225.) This tree is the Deodár of Ibn Sina.

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* लासा lásá; Illit. lásha; any viscous exudation of plants.

† बाखल, बाखर, or बखर an enclosure, house, chamber. An allusion to the small chamber cut in the tree to receive the turpentine.

Taxus baccata, *Linn.*,[*] *Bentl. and Trim., t.* 253. The leaves.

Vernacular.—Barmi, Tálispatr (*Bomb.*)

History, Uses, &c.—Under the name of *Tálishpatra*, Sanskrit writers describe a drug which has carminative, expectorant, stomachic, tonic and astringent properties, and is useful in phthisis, asthma, bronchitis and vesical catarrh. Dutt (Hind. Mat. Med., p. 245,) informs us that "the powdered leaves are given with the juice of Justicia adhatoda (vasaka) and honey in cough, asthma, and hæmoptysis. A confection called *Talisadya churna*, is prepared with Talispatra, black pepper, long pepper, ginger, bamboo-manna, cardamoms, cinnamon, and sugar, and is used in the above mentioned diseases." The author of the Makhzan-el-Adwiya mentions the drug in two places, and identifies it incorrectly with the *Zarnab* of the Arabs; he also appears to confound it with *Hydrocotyle asiatica*. Speaking of Zarnab, he says it is also called *Rijl-el-jarád* (locust's foot). In Hindí it is *brahmi, barambhi* and *sapni*, and one kind of it is called *Manduparni* and *barahmi*, and the plant is called *Tális*, and the leaves, which are the same as Zarnab, are called *tálispatr*. It is a plant with leaves broader than those of *sátar-i-bari*, of a yellowish colour, and scented like a citron; the flower is yellow, and the plant is less than a cubit in height, with a quadrangular hollow stem; it has a pungent taste, and retains its properties four years. It grows in the hills of Fars, and is called *Sarv-i-Turkistáni;* it is also found in Hindustan and Bengal. * * * * It is hot and dry in the second degree, and has stimulant, astringent, stomachic, pectoral and digestive properties similar to cinnamon; the fresh juice is intoxicating; mixed with oil of roses or violets and introduced into the ear it cures cold headache. Substitutes, double the quantity of cinnamon, cubebs, cassia, or cardamoms. * * * * Again speaking of *Tálisfar,** an article described as one concerning the identity of which there is much difference of opinion, the author of the Makhzan says, "perhaps it is the same as Zarnab, which is called Tális in Hindí, and which is the *narrow leaf of a tree of a dusty colour, externally and internally yellow.* If we turn to the older Arabian writers, we find that we have no reason to identify Zarnab with Tálishpatra; they say that it is a certain perfume or certain sweet smelling tree (*Kámús*), or a species of sweet smelling plant (*Sihah*); it consists of slender round twigs, between the thickness of large needles and of writing reeds, black inclining to yellowness, not having much taste or odour, what odour it has, being of a fragrant kind like citron. (Ibn Sína, Book II.) According to the Turkish Kámús, it is the leaf of a sweet-smelling plant called رجل الجراد (Locust's foot). Sprengel thought it was 'Salix Ægyptiaca.' (Confer. Hist. rei. herb., T. II., p. 270.) Zarnab is of the measure فعلل, and is a genuine Arabic word. A rájiz says—

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[*] ταξος and σμιλαξ. Dios. 4, 80; Plin. 16, 20 and 33, 14.

يا بابي انت وفوك الاشنب

كانّما ذرّ عليه الزّرنب

"O with my father thou *shouldest be ransomed,* and thy mouth, that is cool and sweet, as though Zarnab were sprinkled upon it." (*Sihah.*)

In the tradition of Umm Zara, where it is said, المس مس ارنب و الريح ريح زرنب the feel is the feel of a hare, and the odour is the odour of Zarnab. Ibn el Athír, author of the Nihayeh, says that it signifies saffron (*Madd-el-kamûs*). Ainslie (II. 407,) considers Tálispatr to be the leaves and twigs of Flacourtia cataphracta, *Roxb.* Dr. U. C. Dutt, in his Hindu Materia Medica, states that the Tálispatr of the Calcutta shops consists of the leaves and twigs of Abies Webbiana, *Lindl.** Dr. Moidín Sheriff gives the name of Tálishapatri to the leaves of Cinnamomum Tamala, *Nees.* It would appear, therefore, that it is uncertain at the present time what the Tálishpatra of Sanskrit writers is, and that in different parts of the country various drugs are used as substitutes for it.

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* Under this name Royle obtained the leaves of Rhododendron lepidotum, which are highly aromatic (Antiq. of Hind Med., p. 91.).

The yew was known to the Greeks and Romans as a poisonous plant. Modern enquiry has shown that the leaves and seeds are poisonous, but not the red pulp surrounding the latter. The leaves have however been recommended in doses of from 1 to 5 grains in epilepsy and other spasmodic affections. As an abortive they have been often administered and have generally proved fatal to the woman, without causing the expulsion of the fœtus. Moderate doses given to animals occasion hurried breathing and palpitation of the heart, followed by recovery, and larger doses produce a similar effect followed by death from syncope. Very large doses appear to produce death by syncope without pain or spasm. According to Borcher's (1876) experiments, taxine reduces the pulse and respirations and causes convulsions, with fatal asphyxia. (Husemann.) After death the evidences of gastro-intestinal inflammation have generally been slight, the heart was usually empty, the kidneys strongly congested, and the blood less coagulated than usual. The effects produced upon man by poisonous doses of yew resemble those above mentioned as occurring in animals: after large doses the nervous irritation, exhaustion and gastric disturbance may be very trifling, the patient dying by syncope.

Description.—The Bombay drug consists of the small branches of the tree with their linear-lanceolate, narrow, rigid, veinless leaves cut up into short lengths (1 to 2 inches). The male flowers are to be found upon some of the sprigs, and resemble those of the common yew. The wood of the larger stems is that of a yew, and not of a pine.

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* **Webb's or Purple coned Fir.**

Chemical composition.—W. Maviné (Chem. Centr., 1876, 166-167,) has confirmed the presence of an alkaloid Taxine in the leaves and seeds of this tree. He says:—"Lucas isolated from 2 lbs. of the leaves of this tree three grains of a body which he calls taxine, and gave a few reactions regarding it. For its preparation Stass's method for detecting alkaloids was followed out, without giving satisfactory results. The following process was more successful:—The leaves or seeds are powdered, and repeatedly exhausted with ether; the extracts are mixed, and the ether is distilled off. The residue which when obtained from the leaves forms a green resinous mass, having a peculiar aromatic smell and sharp taste, while in that from the seeds there is a large quantity of a fatty oil, was repeatedly shaken up with water, acidulated, and slightly warmed. The water separated from the residue was filtered, and in the clear and colourless filtrate the taxine was precipitated by ammonia or fixed alkali, in snow-white bulky flakes. When washed and dried over sulphuric acid, it forms a white crystalline powder, which is scarcely soluble in distilled water, readily soluble in acidulated water, alcohol, ether, chloroform, benzine, and carbon disulphide, insoluble in petroleum and ether. It has no smell, but a very bitter taste. Pure concentrated sulphuric acid reddens it; nitric, hydrochloric, and phosphoric acids dissolve it without change of colour. With most of the reagents, characteristic of alkaloids, tannic acid, phosphomolybdic acid, potassio-mercuric iodide, potassio-cadmic iodide, potassio-bismuthic iodide, iodopotassic iodide, potassio argentic cyanide, potassic bichromate, picric acid, it yields, in an acid solution, amorphous precipitates. Platinic chloride, auric chloride, mercuric chloride, potassio-platinous cyanide are not precipitated. It does not form crystallized salts with the ordinary acids. It is nitrogenous (evolves ammonia when heated with freshly ignited soda-lime), melts at 80°, and burns without residue when heated more strongly. Taxine is present in the leaves in larger quantities than in the seeds of the yew tree.

Juniperus communis, *Linn., Bentl. and Trim., t.* 255. The berries under the name of Hab-el-arhar, are sold in the Bombay shops. They are imported from the Persian Gulf ports.

SCITAMINEÆ.

Zinziber officinale, *Roscoe, Bentl. and Trim., t.* 270. The rhizome.

Vernacular.—(Fresh) Adrak, (dry) Sonth (*Hind.*), (fresh) Alen, (dry) Sont (*Bomb.*), (fresh) Ada, (dry) Sont (*Beng.*), (fresh) Inji, (dry) Shukku (*Tam.*)

History, Uses, &c.—Ginger has been known to the Hindus, and cultivated in India from a very remote period. The fresh rhizomes are called Ardraka and Sringavera in Sanskrit, and dried ginger Nagara, Sunti, and Mahaushadha. In Sanskrit works ginger is mentioned as one of the three acrids (trikatu), the other two being black pepper and long pepper; it is chiefly used in Hindu Medicine as a carminative and rubefacient. Ginger is the σιγγίβερι of the Greeks, the Zinziber of the Latins, and the Zanjabil of the Arabians. As a seasoning to food it is cultivated in all parts of India, the fresh rhizomes being always obtainable in the vegetable markets. Fresh ginger is much used as a domestic medicine, the juice with sugar or honey being used with advantage in colds and coughs, and with the addition of limejuice in bilious dyspepsia. Ginger juice with an equal portion of Tulsi juice and a little honey and burnt peacocks' feathers is the popular remedy for vomiting in this part of the country. In the Bombay Presidency, ginger is chiefly cultivated in Guzerat; it is planted in May, and the produce, which averages from 50 to 150 maunds per beegah, gathered in the following February or March. In a green state it sells at from ¾ to 1¼ maund (of 25 lbs.) per rupee; dried at from 5 to 10 seers per rupee.

For a description of ginger the reader is referred to standard works on Materia Medica. The best Indian ginger is grown on the Malabar Coast, and approaches in quality to Jamaica ginger. Bengal and Bombay gingers are horny and dark-coloured.

Chemical composition.—Ginger has been very completely examined by J. C. Thresh. (Confer. Year-Book of Pharmacy, 1879.) He found Cochin ginger to contain volatile oil 1·350; fat, wax (?) and resin (P. ether solution), 1·205; neutral resin ·950; *a.* and *b.* resins, ·865; Gingerol, ·600; substance precipitated by acids, 5·350; mucilage, 1·450; indifferent substance precipitated by tannin, organic acids, &c., 6·800; extractive soluble in alcohol not in ether or water, ·280; alkaloid a trace; Metarabin, 8·120; starch, 15·790; Pararabin, 14·400; Oxalic Acid (as $Ca\ C_2O$), ·427; Cellulose, 3·750; albuminoids, 5·570; Vasculose, &c., 14·763; moisture, 13·530; ash, 4·800. The essential oil is pale-yellow, lævogyre and not acrid. Gingerol, the active principle, is a straw-coloured, viscid, odourless fluid of extremely pungent taste. For further information confer. Thresh Pharm. Journ., 3rd Series, XII., 721, and Year-Book of Pharmacy, 1882.

Commerce.—The exports of ginger from Bombay in 1881-82 were 2,054,580 lbs., valued at Rs. 2,74,533; of this quantity 884,578 lbs. went to the United Kingdom, and the remainder to Eastern ports.

Three kinds are met with in this market, *viz.* :—

Ahmedabad,	value	Rs. 12	per cwt.
Calcutta,	,, ...	,, 12	,,
Malabar (Cochin),	,, ...	,, 24 to 40	,,

Zinziber Cassumunar, *Roxb. in As. Res.* 11, *t.* 7; *Bot. Mag.*, *t.* 1426. The rhizome.

Vernacular.—Ban-áda (*Hind.* and *Beng.*), Nísan, Peulé-kosht (*Mar.*), Karpushpú (*Teling.*)

History, Uses, &c.—The rhizome of this species of Zinziber, though used medicinally by the country people, appears never to have been an article of commerce in India. In the Concans it has a reputation as a remedy in diarrhœa and colic. The fresh rhizome is rubbed down with water for administration. The Sanskrit name is Vanardraka.

Description.—An excellent figure of the plant will be found in Roscoe's Monandrian Plants. The fresh rhizomes are 1 to 2 inches in diameter, jointed, compressed, with numerous white fleshy radicles, to some of which white tubers are attached. Each joint of the rhizome is furnished with a leaf bud. The epidermis is scaly, light-brown, the interior of a rich golden yellow, the odour is powerful and not very pleasant, like a mixture of ginger, camphor, and turmeric; the taste hot and camphoraceous.

Microscopic structure.—The epidermis is formed of many layers of compressed and obliterated cells. The parenchyma consists of large polyhedral cells; those in the cortical portion of the rhizome are nearly free from starch, but those in the central portion are filled with large ovoid starch granules. In all parts of the rhizome large cells full of a golden-yellow essential oil abound. The vascular system resembles that of turmeric.

Curcuma longa, *Roxb., Bentl. and Trim., t.* 269. The rhizomes.

Vernacular.—Haldi, Halad (*Hind., Beng.* and *Bomb.*), Manjal (*Tam.*)

History, Uses, &c.—Turmeric has been cultivated in India from a very remote period; it is an essential ingredient in curries, and is considered to be cordial and stomachic. Turmeric made into a paste with oil is rubbed on the skin in marriage festivals and other religious ceremonies of the Hindus.

As a medicine, it is applied in skin diseases, and also given internally. The powder is applied to foul ulcers to clean them. Turmeric paste with the addition of lime is a popular application to bruises, sprains, wounds, leech-bites, &c. A decoction is used as a cooling lotion in conjuctivitis ; boiled in milk and sweetened tumeric is a popular remedy for colds. Dutt informs us that the Sanskrit term Haridradve, or the two turmerics, signifies turmeric and the wood of Berberis asiatica (Dár-halad or stick turmeric of the Arabians). He says :—"They are often used together in compound prescriptions both for external and internal use, and their properties are said to be analogous." Dioscorides mentions an Indian plant as a kind of κύπειρος resembling ginger, but having when chewed a yellow colour and bitter taste. The Mahometans use turmeric medicinally in the same manner as the Hindus ; they also prescribe it in affections of the liver and jaundice on account of its yellow colour. There are many Arabic names, the best known are Urúk-es-sufr and Urúk-es-sabághín. The Persian name is Zard-chubah. The editor of the Pharmacopœia of India speaks favourably of the use of a decoction of turmeric in purulent conjunctivitis ; he says it is very effectual in relieving the pain. In coryza he states that the fumes of burning turmeric directed into the nostrils cause a copious mucous discharge, and relieve the congestion. (Pharmacopœia of India, p. 231.)

Dalzell and Gibson (Bombay Flora, Pt. II., p. 87,) inform us that the turmeric plant is largely cultivated in those parts of the Bombay Presidency, where the garden soil is of superior quality, and water abundant. In the Kaira zillah it is planted in May, and yields from 60 to 300 maunds (of 26 lbs. each) per beegah. An average crop will give a return equal to sugar-cane, *viz.*, Rs. 100 per beegah. The root is roasted to dryness in ovens, and is then ready for exportation. The starch of the young tubers at the end of the radicles which are nearly colourless forms one of the East Indian arrowroots.

It is to be observed that the tubers which yield only starch when young will yield turmeric when old, the colouring matter and aromatic principles are deposited in the cells at a later period of growth; this is the case with almost all the Curcumas which have aromatic and coloured central tubers.

Description.—The rhizome of the turmeric plant, like that of most Curcumas, consists of a central ovoid portion and several lateral elongated portions, all of a deep orange colour, from these proceed a number of radicles, at the ends of some of which colourless oval tubers are produced. The central and lateral rhizomes form the round and long turmeric of commerce. The former vary a good deal in size and shape; they may be pyriform, ovoid, or almost round, and are generally cut up into two or more pieces, the latter are cylindrical, tapering towards the extremities, and often more or less bent, both are marked by transverse furrows, and bear remains of the rootlets and leaf-buds. Turmeric is of a deep brownish-yellow colour, of firm resinous consistence, and has a peculiar aromatic odour.

Microscopic structure.—Sections of the fresh rhizome show the exterior to be composed of several layers of compressed brown cells. The parenchyme consists of delicate polygonal cells of a yellow colour, the majority contain starch grains which are mostly elongated, but some are pyriform or ovoid; a smaller number of cells contain globular masses of yellow resinous matter, and a rich orange-yellow essential oil; those cells which contain much resin have little or no oil, when the resin is in small quantity there is much oil. The vascular system consists of scalariform and spiral vessels, which are most abundant near the boundary line which separates the cortical from the central portion of the rhizome. This boundary line is composed of small empty cells, having thicker walls than those of the rest of the parenchyme.

Chemical composition.—Turmeric contains about 1 per cent. of an essential oil.

Curcumin, the yellow-colouring matter of turmeric, has been examined by several chemists, whose experiments have led to the conclusion that its formula is either $C_{10} H_{10} O_3$ or $C_{16} H_{16}$

O_4, that it melts at 172°, forms red-brown salts with alkalies, is converted by boric or sulphuric acid into rosocyanine, by reduction with zinc-dust into an oily body, by oxidation into oxalic or terephthalic acid, and by fusion with potash into protocatechuic acid. The experiments of Jackson and Menke have, however, led to results differing in many respects from those above detailed, which were probably obtained from impure preparations.

The Curcumin used in their experiments was prepared by treating ground turmeric root (Bengal or Madras) with light petroleum to remove turmeric oil, and then with ether, which dissolves the Curcumin together with a large quantity of resin; and it was finally purified by crystallization from alcohol. The quantity of Curcumin thus obtained was only 0·3 per cent. of the root; the total quantity contained in the root is, however, much larger, as a considerable amount remains mixed with the resinous impurities, and some also in the oil. Curcumin thus prepared crystallizes from alcohol in stout needles, appearing on microscopic examination to be made up of well-formed prisms with square ends, or in spindle-shaped crystals often arranged in radiate groups. It has an orange to yellow colour, according to the size of the crystals, with a beautiful blue reflex; its solution in ether exhibits a strong green fluorescence. It is inodorous when pure; melts at 178°, apparently with decomposition. It is nearly insoluble in water, somewhat soluble in cold, more readily in hot ethyl and methyl alcohols, more soluble in glacial acetic acid, less in ether, very slightly in benzene and carbon bisulphide, and all but insoluble in light petroleum. Strong sulphuric acid dissolves it with a fine reddish purple colour, gradually changing to black from charring; Curcumin dissolves readily in alkalies and alkaline carbonates. Its ammoniacal solution gives off ammonia when boiled, and deposits unaltered Curcumin. Baryta water converts it into a blackish-red powder, but lime water gives a red solution like that obtained with calcium carbonate. Curcumin is not affected by acid sodium sulphite. Pure Curcumin gives, as the mean of several analyses, 68·30 per cent. carbon and 5·63 hydrogen, leading to the formula $C_{14}H_{14}O_4$, which requires 68·29 carbon, 5·69 hydrogen, and 26·02 oxygen, and this formula has been confirmed by the analysis of several derivatives. For an account of the derivatives of Curcumin, confer. Phar. Journ., Dec. 30th 1882.

Turmeric oil or Turmerol, to which turmeric (and therefore curry powder) owes its aromatic taste and smell, has been extracted from Bengal turmeric by C. L. Jackson and A. E. Menke with light petroleum, and after being freed from the higher-boiling portion of that solvent by heating to 150° in a flask, it formed a thickish oily yellow liquid having a pleasant aromatic odour. It was purified by fractional distillation under diminished pressure, and was thereby separated into three portions, the first boiling below 193°, the second at 193° to 198°, and the third consisting of a viscous semi-solid residue. The middle portion consisted of nearly pure turmerol; the first of that substance contaminated with hydrocarbons from the petroleum. The middle fraction, after further purification by distillation in a vacuum, gave, as a mean result of several analyses, 83·62 per cent. carbon and 10·42 hydrogen, agreeing nearly with the formula $C_{19}H_{28}O$, which requires 83·81 C. and 10·29 H.

Turmerol is a pale yellow oil having a pleasant aromatic smell, and a density of 0·9016 at 17°. It is optically dextrogyrate, $[a] = 33{\cdot}52$. Under ordinary pressure it boils at 285° to 290°, but decomposes at the same time, yielding a substance of lower boiling point. (Amer. Chem. Journ., IV., pp. 368-374.)

Commerce.—The kinds of turmeric met with in Bombay are Bálseni, Rs. 50 to Rs. 60 per candy of 5¼ cwt.; Rajapuri, Rs. 50 to Rs. 55; Kálicot, Rs. 50 to Rs. 55; Calcutta, Rs. 40 to Rs. 55.

Curcuma angustifolia, *Roxb.*, appears to be the chief source of East Indian arrowroot, the vernacular names of which are Tikhur (*Hind.*), Kúa, (*Tam.*), Tavakhír (*Bomb.*) Drury informs us that an excellent arrowroot is prepared from the tubers in Travancore, where the plant is very abundant. The exports from that country average about 250 candies annually; in 1869-70, 3,729 cwts., valued at Rs. 14,152, were exported from Madras. The mode of preparation is as follows:—The tubers are first scraped on a rough stick, generally part of the stem of the common rattan, or any plant with rough prickles, to serve the same purpose. Thus pulverised, the flour is thrown into a chatty (globular earthen vessel) of water, where it is kept for about two hours, all impurities being carefully removed from the surface. It is then taken out and again put into fresh water, and so on, for the space of four or five days. The flour is ascertained to have lost its bitter taste when a yellowish tinge is communicated to the water, it is then stirred up, strained through a piece of coarse cloth, and put in the sun to dry.

Arrowroot is a favourite article of diet among the natives, especially for children. The milkmen in Bombay use it to thicken milk which has been watered.

Commerce.—Malabar arrowroot fetches from Rs. 3 to Rs. 4 per quarter cwt. in Bombay.

Curcuma aromatica, *Salisb.*, *Wight Ic.*, *t.* 2005. The rhizome.

Syn.—Curcuma Zedoaria, *Roxb.*

Vernacular.—Ambè-haldí, Rán-halad (*Bomb.*), Ban-haldí, Janglí-haldí (*Hind.* and *Beng.*), Kasturí-manjal (*Tam.*), Kattumannar (*Malay.*)

History, Uses, &c.—This rhizome is the Vanaharidra of Sanskrit works, and there appears to be little doubt that it is the Jadwár described by Avicenna (Lib. II., p. 155,) and figured in Clusius' Exotica, p. 378. At the present time the Jadwár of India is quite a different article. (See Delphinium denudatum.) Ainslie, whose description of the Zedoaries is excellent, tells us that in his time the Mahometans supposed it to be a valuable medicine in certain cases of snake-bite, administered in conjunction with golden orpiment, costus, and ajwain seeds. He also expresses his opinion that it was the Jadwár of the old Arabian writers. Ambè-haldi is no doubt the Zedoaire jaune of Guibourt, who tells us that the plant which produces it has been well described and figured by Rumphius. It is his Tommon bezaar or Tommon primum, which has been wrongly referred by most writers to the Curcuma Zedoaria of Roscoe. (Confer. Guibourt His. Nat., 6^{me} Ed., tom. II., p. 214.) It would appear also that it is identical with the Cassumunar described by Pareira. (Confer. Pareira Mat. Med., Vol. II., Pt. I., p. 236.) Lastly, it would appear to be the same as the "Cochin Turmeric" noticed by Flückiger and Hanbury. (Pharmacographia, p. 580.) The properties of this drug are very similar to those of turmeric, but its flavour being strongly camphoraceous is not so agreeable. It is used medicinally in combination with other drugs as an external application to bruises, sprains, &c. In the Concan it is applied to promote the eruption in the exanthematous fevers; it is seldom used alone, but is combined with astringents when applied to bruises, and with bitters and aromatics to promote eruptions. Like turmeric its principal use is as a dyeing agent; it is never used as a condiment in India. The plant which produces this drug grows wild in the Concan; under cultivation it produces central tubers as large as a small turnip. I have had it under cultivation for some years, and observe that the leaves when young have a central purple stain which almost disappears when they attain their full size. The flowers appear in May or June, with the first leaves, just before the rainy season.

Description.—Central rhizome oblong or conical, often more than two inches in diameter, external surface dark-grey, marked with circular rings and giving off many thick rootlets; at the ends of some of them are orange-yellow tubers about the size and shape of an almond in its shell; lateral rhizomes about as thick as the finger with a few fleshy rootlets. Internally both central and lateral rhizomes are of a deep orange colour like turmeric; the odour of the fresh root is strongly camphoraceous.

Microscopic structure.—Similar to that of turmeric.

Commerce.—The Bombay market is supplied from the Malabar Coast. Value, unpeeled, Rs. 24 to Rs. 25 per candy of 5¼ cwts.; peeled, Rs. 27 per candy.

Curcuma Zedoaria, *Roscoe, Wight Ic., t.* 2005; *Rheede Hort. Mal. xi., t.* 7. The rhizome.

Syn.—Curcuma Zerumbet, *Roxb.*

Vernacular.—Kachúra (*Hind.*), Shuthí, Kachora (*Beng.*), Kachúra (*Bomb.*), Palan-kizhangu (*Tam.*)

History, Uses, &c.—This drug is the Karchúra of Sanskrit writers, and the Zarumbád and Urúk-el-káfúr of the Arabs and Persians. (Confer. Rhazes, p. 152-156; Avicenna, Lib. II., p. 166; Sprengel Hist. rei herbar, T. I., p. 241.) Ainslie remarks that it is the *lampooyang* of the Javanese, and the lampuium of Rumphius (Amb. 5, p. 148,) and that it is a native of the East Indies, Cochin-China, and Otaheite; he also says it is evidently the Zerumbet of Serapion, and Zerumbád of Avicenna, who speaks thus of it:—"Discutit flatus, cor recreat, vomitionem compescit; ad venenatarum bestiolarum morsus efficax est." (Canon. Med. Lib. II., p. 118.)* Ainslie then proceeds to quote Geoffroy's description of the drug, which leaves no doubt as to its identity with the modern Kachora—"Foris cinerea, intus candida; sapore acri-amaricante aromatico; odore tenui fragrante, ac valde aromaticum, suavitatem, cum tunditur aut manducatur, spirante et ad camphoram aliquatenus accedente." (Vol I., pp. 190 and 194.) Guibourt tells us that this zedoary is the Zerumbet of Serapion, Pomet, and Lemery. The following is his description of it:—"The round zedoary is greyish-white, externally heavy, compact, grey and often horny internally, having a bitter and strongly camphoraceous taste, like that of the long zedoary, which it also resembles in odour. The odour of both drugs is analogous with that of ginger, but weaker unless the rhizome be powdered, when it developes a powerful aromatic odour, similar to that of cardamoms." (Hist. Nat., 6me Ed., Vol. II., p. 213.) In my opinion there is no doubt that C. zerumbet is the source of the round and long zedoaries of commerce. The plant is common in Bombay gardens, and was probably introduced by the Portuguese, whose descendants and converts at the present day use the leaves in cookery, especially with fish. From Dr. Hove's account of Bombay in 1787 it appears that Kachúra and Turmeric were cultivated at that time in the cocoanut woods at Mahim. The natives chew the root to correct a sticky taste in the mouth; it is also an ingredient in some of the strengthening conserves which are taken by women to remove weakness after child-birth. In colds it is given in decoction with long-pepper, cinnamon and honey, and the pounded root is applied as a paste to the body. I have had the plant in cultivation for some years; it blossoms in the hot weather just before the rains, when the first leaves begin to appear.

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* يحل الرّياح وغيره — مفرح للقلب — يحبس القيء وغيره — ينفع من لذع الهوام وغيره

Description.—Guibourt's description already given agrees exactly with the Kachúra of India, but it is often cut into transverse slices instead of into halves and quarters.

Microscopic structure.—This is essentially the same as that of turmeric, but the resin and essential oil in the cells is of a yellowish-white colour, and the greater portion of the starch grains are ovoid or pyriform, instead of narrow and elongated as in turmeric.

Chemical composition.—Zedoary contains according to Bucholz (Repert. Pharm. XX., 376,) volatile oil, a bitter soft resin, a bitter extractive matter, gum, starch, &c. The oil is turbid, yellowish-white and viscid, has a camphoraceous taste and smell, and consists of two oils, one lighter, the other heavier than water. Trommsdorff obtained from the root a substance which he called *Zedoarin*, but did not further describe it.

Commerce.—The Bombay market is supplied from Ceylon. Value, Rs. 20 to Rs. 30 per candy of 7 cwts. The drug is chiefly used in India as a cosmetic. Roxburgh tells us that Bengal is supplied from Chittagong.

Curcuma cæsia, *Roxb., Rumph. Amb. V., p.* 169. The rhizome.

Vernacular.—Nar-kachúra, Kálí-haldí (*Hind.*), Nílkanth (*Beng.*), Nar-kachúra (*Bomb.*)

History, Uses, &c.—This drug is one of the two Zerumbáds of modern Persian writers on Materia Medica, and is doubtless the Black Zedoary described by Ibn Baitar. Strange to say, it is not noticed by most European writers on Indian drugs, though it is well known and to be found in all the shops. It is the Tommon itam of Rumphius and the Curcuma long of Guibourt, who classes it with the turmerics. (Confer. Hist. Nat. Tom. II., p. 210, 6me Ed.), where a figure will be found. Guibourt's description is as follows:—"Ce curcuma est en tubercules cylindriques, c'est-à-dire qu'il conserve sensiblement le même diamètre dans toute sa longueur, malgré ses différentes sinuosités. Il est plus long que le précédent, mais beaucoup plus mince, n'étant jamais gros comme le petit doigt; sa surface est grise, souvent un peu verdâtre, rarement jaune, chagrinée, ou plus souvent nette et unie. Il est à l'intérieur d'une couleur si foncée qu'il en parait rouge-brun, ou même noir. Il a une odeur aromatique très dévelopée, analogue à celle du gingembre; sa saveur est également très aromatique et cependant assez douce et nullement amère. Il est impossible de méconnaître dans cette racine les articles digités du *Curcuma domestica minor*. Enfin, on trouve dans le curcuma du commerce, mais en petit quantité, des tubercules ronds de la grosseur d'une aveline, souvent didymes, ou offrant les restes de deux stipes foliacés. Ces tubercules offrent d'ailleurs tous les caractères des précédents, et sont les *matrices radicis* du *Curcuma domestica minor*." Nar-kachúra appears to have been once imported into Liverpool under the name of *Kutchoo*. (Confer. Phar. Jour. (II.), Vol. I., p. 17.)

The plant is a native of Bengal, and is cultivated there to supply the Indian market. Nar-kachúra is considered to have nearly the same medicinal properties as Kachúra; it is chiefly used as a cosmetic. The author of the Makhzan describes it as a kind of Zerumbád. (See article "Zerumbád.") Through the kindness of Surgeon-Major Peters I have been supplied with living tubers of this Curcuma from Dinapore; he informs me that it is common in gardens in Bengal, and is used as a domestic remedy in the fresh state much as turmeric is in this part of India. The fresh tubers are of a pale yellow colour, but after boiling and drying they assume the *couleur foncée* of the drug found in the shops.

Description and Microscopic structure.—The minute structure of this rhizome hardly differs from that of the zedoary. The starch contained in the cells of the parenchyme has been altered by heat, and appears as a finely granular mass nearly filling the cell. The resin cells are about as numerous as in the zedoary, but the contents are of a dusky orange colour. The vascular system consists of scalariform and spiral vessels. As to the drug it consists of small nearly globular central tubers, from which spring numerous lateral rhizomes about the size of ginger. It is of a dark-grey colour externally, and marked with circular rings. Internally it is very hard and horny, of a greyish black, but when cut in thin slices of a greyish-orange. The odour and taste are camphoraceous.

Commerce.—The drug comes overland from Bengal. Value, Rs. 4 to Rs. 5 per maund of 41 lbs. Guibourt appears to have become acquainted with it from its admixture with the turmeric of commerce.

Alpinia officinarum, *Hance, Bentl. and Trim., t.* 271. The rhizome.

Vernacular.—Chota-kulijan, Chote-pán-kí-jar (*Hind., Beng.* and *Bomb.*), Shita-rattaí (*Tam.*)

History, Uses, &c.—Although this drug has been long known, its botanical source was only discovered in 1870, when a description of the plant was communicated to the Linnean Society of London by Dr. H. F. Hance, made from specimens collected by M. E. C. Taintor near Hoihow, in the north of Hainan. (Confer. Journal of the Linn. Soc., 1873, XIII., 6.) Galangal is not much used in Hindu medicine. In Sanskrit works it is called Kulinjana, evidently a corruption of the Arabic Khúlanján. Galangal is described by Serapion on the authority of Ishák bin Amrán as hot and dry in the third degree, useful to phlegmatic persons, and in humidity of the stomach ; it promotes digestion by its heat and the solution which it occasions in the stomach, and thus relieves colic ; gives fragrance to the breath, and warms the kidneys : it sets the semen in commotion, and when a piece of it is held in the mouth it occasions erections of the membrum virile. Other Arabian writers give a similar account of it. Indian Mahometan writers with reference to the name Pán-kí-jar say that the drug may be the root of very old plants of Piper betel, but they are evidently in doubt about its being produced by that plant. (Confer. Makhzan, article "Khúlanján.") Mír Muhammad Husain describes Galangal as tonic, stomachic, carminative, stimulant, and aphrodisiac. He tells us that if given to young children it makes them talk early, and that a paste of the powdered drug made with oil or water will remove freckles. It is a stomachic tonic, used by native practitioners to reduce the quantity of urine in diabetes. It is used to correct foul breath when chewed, and the juice swallowed stops irritation in the throat. (Emerson.) The Persian name is Khusrú-dárú. Galangal is one of the ingredients of Warburg's tincture. It is not used in Englsh medicine, but there is a considerable demand for it in Russia. Irvine (Med. Topog. of Ajmeer, p. 171,) says that the natives add Kulijan to bazar spirit to make it more intoxicating.

Description.—The dried rhizomes are about as thick as the little finger or often less. They have evidently been cut into shorts lengths (2 to 3 inches) while fresh ; many of the pieces are branched, and all are marked by numerous circular ridges of a light colour. The external surface of the rhizome is of a deep reddish-brown, the interior pale, red, hard and tough ; the odour is aromatic, and the taste hot and spicy.

Microscopic structure.—The bulk of the rhizome consists of a uniform parenchyma traversed by fibro-vascular bundles, some of the parenchyme cells are full of resin and essential oil, but most of them contain large starch grains of an elongated or club-shaped form.

Chemical composition.—Galangal contains from $\frac{1}{5}$ to $\frac{1}{2}$ per cent. of an essential oil, which is the odorous principle; according to Vogel its formula is $C^{10} H^{16} O$. Brandes extracted from Galangal with ether a neutral, inodorous, tasteless, crystalline body, Kæmpferide. E. Jahns (1883) has isolated the following compounds from the root: Kämpherid, $C^{16} H^{12} O^{6} H^{2} O$, crystallizing in yellowish needles (m. p. 221°), which are slightly soluble in water, ether and benzine, freely soluble in alcohol, soluble in alkalies to an intensely yellow solution, and in concentrated sulphuric acid to a yellow solution with a strong blue fluorescence. Galangin, $C_{15} H_{10} O_{5} H_{2} O$) crystallizing from its solution in aqueous alcohol in yellowish white needles (m. p. 214°). The reactions of this body are very similar to those of Kämpherid; its solution in concentrated sulphuric acid, however, is non-fluorescent.

Alpinin, $C_{17} H_{12} O_{6}$, crystallizes in yellowish needles (m. p. 173°). Its reactions are similar to those of galangin. (Archiv der Pharm., CCXX., 161; Year-Book of Pharmacy, 1883, p. 199.) The resin, which is probably the acrid principle, has not been examined.

Dr. Thresh (1884) has isolated from Galangal root an active pungent principle, which he has named *Galangol,* and which resembles the pungent principles of Ginger, Capsicum, and Grains of Paradise in certain respects. He records the following proximate analysis of 100 parts of the rhizome:—Volatile oil 0·6, Resin 0·2, Fat and *Galangol* 1·6, Kampferid, &c., 1·4, other saline matters soluble in ether but not precipitated by Pb. A_2 1·2, Tannin 0·6, Phlobophane 1·2, other substances soluble in alcohol 3·2, Glucose, mucilage, &c. 3·5, Oxalic acid 0·3, Galangal red 2·8, Starch 23·7, Albumenoids 2·6, Moisture 13·8, Ash 3·8, Cellulose, &c., 39·5. The active principle could not be isolated in a state of purity.

Commerce.—Galangal arrives in Bombay from Canton and other Chinese ports. The imports are about 1,000 cwts. yearly. Value, Rs. 3-8 per maund of 37½ lbs.

The **Great Galangal**, though not so much used as the lesser, is well known in Bombay as Barí-pán-ki-jar, Malabarí-pánkíjar or Kost-kulijan. The native dealers all state that it is imported from the Malabar Coast.* This drug is generally considered to be produced by Alpinia Galanga, Swartz, a native of Java; it is easily distinguished from the lesser Galangal by its larger size, orange-brown exterior and yellowish-white interior. It is also less aromatic and pungent. Value, Rs. 50 per candy of 7 cwts.

Musa paradisiaca, *Linn., Rheede Hort. Mal. i., t.* 12 *to* 14; *Roxb. Cor. Pl. iii., t.* 275.

Vernacular.—Kela (*Hind.* and *Bomb.*), Kala (*Beng.*), Vazhaip-pazham (*Tam.*)

History, Uses, &c.—The plantain, in Sanskrit Kadalí and Rambhá, and in Arabic Mauz and Talaa (طلع), is the most valuable of Indian fruits, being always obtainable and excellent either raw or cooked. In Bombay the choicest sorts for the table are the *Eláchi*, the *Basra* and the *Red*, and for cooking the large yellow *Manyel*. The abortive flowers at the end of the spike are removed and used as a vegetable by the Hindus, and the unripe fruit, called *Mochaka* in Sanskrit, is used medicinally on account of its astringent properties in diabetes; it is made into a *ghrita* with the three myrobalans and aromatics. Young plantain leaves are universally used as a cool dressing for blisters and to retain the moisture of water dressings; they serve also as a green shade for the eyes. Emerson notices the use of the sap to allay thirst in cholera. Mír Muhammad Husain in the Makhzan tells us that the centre of the stem, called in Hindi *Kanjiyál*, is eaten with fish as a vegetable in Bengal, that the kind called *Málbhok* is used as a poultice to burns, and that called *Bolkad* is boiled and used as an ointment to the syphilitic eruptions of children; he also notices the use of the ashes on account of their alkaline properties, and of the root as an anthelmintic. The plantain was known to the Romans and is described by Pliny (12, 6,) under the name of Pala.

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* Babu T. N. Mukharji in his Amsterdam Catalogue informs us that the Java plant is now cultivated in Eastern Bengal and South India.

Chemical composition.—Professor Johnston, in the Journal of the Agricultural Society of Scotland, says: We find the plantain *fruit* to approach most nearly in composition and nutritive value to the potatoe, and the plantain *meal* to that of rice. Thus the fruit of the plantain gives 37 per cent., and the raw potatoe 25 per cent. of dry matter. In regard to its value as a food for man in our northern climates, there is no reason to believe that it is unfit to sustain life and health; and as to warmer or tropical climates, this conclusion is of more weight. The only chemical writer who has previously made personal observations upon this point (M. Boussingault), says, "I have not sufficient data to determine the nutritive value of the Banana, but I have reason to believe that it is superior to that of potatoe. I have given as rations to men employed at hard labour about 6½ pounds of half ripe bananás and two ounces of salt meat." Of these green bananás he elsewhere states that 38 per cent. consisted of husk, and that the internal eatable part lost 56 per cent. of water by drying in the sun. The composition of the ash of the plantain also bears a close resemblance to that of the potatoe. Both contain much alkaline matter, potash, and soda salts; and in both there is nearly the same percentage of phosphoric acid and magnesia. The growing parts of the plant contain much tannic and gallic acid. The ripe fruit of the plantain contains according to Corenwinder (Compt. rend. 57, 781) 73·9 per cent. Water, 4·82 Albumin, 0·2 Cellulose, 0·63 Fats, 19·66 Cane-sugar and inverted sugar (together with organic acids, pectose, and traces of starch), 0·06 Phosphoric anhydride, and 0·73 Lime, alkalies, iron, chlorine, &c. The ash of the husk of the ripe fruit was found to contain 47·98 Carbonate of Potash, 6·58 Carbonate of Sodium, 25·18 Chloride of Potassium, 5·66 Alkaline phosphates (with a little sulphate), 7·50 Charcoal, 7·10 Lime, silica, earthy phosphates, &c. In the juice of the flower stem of the same plant Comnille (J. Pharm. (3) 43, 269) found 25·27 per cent. Potash, 9·52 Soda, 15·85 Lime, 5·0 Magnesia, 0·87 Alumnia, with a trace of ferric oxide, 6·30 Chlorine, 0·96 Sulphuric anhydride, 0·87 Phosphoric anhydride, 0·81 Silica and 34·17 Carbonic anhydride (calculated from the bases).

Commerce.—Dried plantains are an article of commerce in Bombay, and are excellent when stewed with sugar, or fried in butter. Bombay exports annually from 300 to 400 cwts. The local market is supplied with fresh plantains chiefly from Bassein, where they are extensively cultivated.

Costus speciosus, *Sm.*, *Lam. Ill. i.*, *t.* 3; *Rheede Hort. Mal. xi.*, *t.* 8.

Vernacular.—Keú (*Hind.* and *Beng.*), Peṅva पैंवा (*Mar.*), Kemuka (*Sans.*). Roxburgh notices a preserve made of the fresh roots which is considered wholesome and nutritious. C. speciosus is the Tjana-kua of Rheede and the Herba spiralis hirsuta of Rumphius. Ainslie, quoting Brown's History of Jamaica, says that the root is there used as a substitute for ginger, but is very inferior to it. (Mat. Ind. II., 167.) In the Calcutta Exhibition Catalogue, the root is described as depurative and aphrodisiac; similar properties are attributed to it in the Concan, where it is very abundant in moist situations. The rhizome resembles the great Galangal in growth and structure, but has no aromatic properties, the taste being mucilaginous and feebly astringent; it could only be used as a substitute for ginger by being preserved with a quantity of that root sufficient to flavour it.

Hedychium spicatum, *Ham.*, *Bot. Mag.*, *t.* 2300.

Vernacular.—Káfúr-kachrí, Kápúr-kachrí (*Hind.*, *Beng.* and *Bomb.*), Shimai-kich-chilik-kizhangu (*Tam.*)

History, Uses, &c.—Kápúr-kachrí, Kapurakáchalí (*Sans.*), is an article of considerable importance in Indian trade, as it is a principal ingredient in the three kinds of Abír, or scented powder, used by the Hindus in worship, and as a perfume. White Abír is made from the following ingredients:—The root of Andropogon muricatus, the tuber of Hedychium spicatum, sandalwood, and arrowroot (Indian), or flour of Sorghum. The kind of Abír called Ghísí in Hindí, and Padí in Guzeráthí, contains in addition to the above ingredients the seeds of Prunus Mahalib, Artemisia Sieversiana, the wood of Pinus Deodara, the tuber of Curcuma Zerumbet, *Roxb.*, cloves and cardamoms. Black Abír, or Bukka of the Deccan, contains in addition to all the above ingredients, Aloes-wood, costus, the root of Nardostachys Jatamansi, and liquid Storax. The scented powder of the Jains called Vásakhepa or Vásakshepa, does not contain it, but consists of sandalwood, saffron, musk, and Borneo camphor. Two kinds of Kápúr-kachrí are found in the Bombay market, *viz.*, Chinese and Indian; the latter was supposed by Royle to be the Sittarittee or lesser Galangal of Ainslie. (Mat. Ind. I., p. 140), but Moidín Sheriff states that the Sittarittee of the Tamils is the true lesser Galangal, which statement appears to be correct. Powell informs us that the rhizome is pounded with tobacco and smoked in the Punjab.

Description.—Indian Kápúr-kachrí occurs in slices, mostly circular, but sometimes the section is made in a sloping direction; the slices are ½ an inch or less in diameter, and vary much in thickness; they are white and starchy, and when freshly pared exhibit a faint line dividing the cortical from the central portion; the edges of each slice are covered by a rough reddish-brown bark marked with numerous scars and circular rings; here and there rootlets remain attached; the odour is like that of orris root, but more powerful and strongly camphoraceous; the taste pungent, bitter, and aromatic. The Chinese drug is a little larger than the Indian, whiter, and less pungent; the bark is smoother and of a lighter colour.

Microscopic structure.—The rhizome consists of a delicate parenchyma, most of the cells of which are loaded with large ovoid starch grains, a few contain a yellowish resin, and essential oil; the epidermis is composed of several rows of compressed, nearly empty, reddish-brown cells. From the unaltered condition of the starch it appears that the rhizomes are not exposed to heat.

Chemical composition.—The following report by Dr. Thresh, which is of peculiar interest, is given *in extenso* ·—

"A small portion was treated successively with various solvents and the extractives were weighed and examined. The odorous principle was entirely taken up by petroleum ether, and this extractive alone appeared worthy of further consideration. Dry ether exhausted the rhizome more readily, but extracted little or nothing not soluble in the petroleum, and as certain constituents of the plant were found to be more readily isolated from the petroleum solution, the whole of the sample was treated therewith.

Upon allowing the petroleum ether to evaporate slowly, an abundant crop of large, colourless, tabular crystals was obtained, together with a pale yellowish-brown oily fluid. These crystals, after washing with cold petroleum, were submitted to a series of recrystallizations in order to remove traces of the odorous matter. They were finally obtained quite odourless, and found to possess the following properties:—Soluble in petroleum ether, ether, alcohol, chloroform and benzol. Insoluble in diluted solutions of potash, soda or ammonia. Sulphuric acid dissolved it in the cold without production of colour, but if heated the solution became purple red. The alcoholic solution was neutral in reaction, not coloured by ferric chloride or precipitated by basic lead acetate. It did not reduce silver salts.

The melting point (uncorrected) was found to be 120—121° F. (49° C.), and after melting it would remain fluid at ordinary temperatures for days if left undisturbed.

Vapour density.—An attempt to ascertain the vapour density by aid of V. Meyer's apparatus was unsuccessful, as it was found that at the temperature necessary to vaporize it, dissociation took place.

Combustion.—By burning with copper oxide in a current of oxygen the following results were obtained:—

·2931 gram yielded ·7490 gram CO_2 and ·1804 gram H_2O.

·2703 gram gave ·6912 gram CO_2 and ·1690 gram H_2O.

These results as shown below agree with the empirical formula $C_{12}H_{14}O_3$:—

	1	2 Found.	Mean.	Theory.
C	69·71	69·74	69·73	69·90
H	6·82	6·95	5·88	6·80
O	23·47	23·31	23·39	23·30

Action of alkalies.—Mixed with melting caustic potash a considerable amount of the substance is volatilized, and complete decomposition of the remainder is difficult to effect. A boiling strong aqueous solution of potash also acts upon it, but very slowly. Dissolved in alcoholic potash and warmed, the solution, if strong, almost instantly becomes filled with minute nacreous crystals; and the whole at once dissolves when diluted with water. Upon distilling the solution nothing but ethyl alcohol was found in the aqueous distillate. The faintly coloured solution left in the flask gave an exceedingly voluminous white precipitate when acidified, and the acid thus separated possessed the following properties:—

Melting Point, 171-172° C. (uncorrected). Soluble in ether and rectified spirit, almost insoluble in cold water, but fairly soluble in boiling water and deposited from the latter solution in acicular crystals. Readily soluble in dilute ammonia, soda or potash, and decomposed aqueous solutions of their carbonates when boiled therewith. Dilute solutions of the soda salt gave a brick-red precipitate with ferric chloride, a white precipitate with silver nitrate, and no precipitate with barium or calcium chloride. Stronger solutions gave precipitates with both these reagents, which made their appearance in a few seconds and were distinctly crystalline. Copper sulphate produced a blue precipitate, becoming paler, green and more voluminous upon boiling.

Combustion :—

·2144 gram yielded ·5316 gram CO_2 and ·1096 gram H_2O.

·2570 gram of the silver salt yielded ·0957 gram Ag.

These results agree fairly with the formula $C_{10}H_{10}O_3$ for the acid, and $AgC_{10}H_9O_3$ for the silver salt:—

Salt.	Found.	$C_{10}N_{10}O_3$.
C	67·63	67·42
H	5·69	5·62
O	26·68	26·96

Ag found 37·24 per cent.; theory requires 37·89.

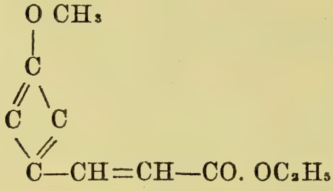
The per cent. of silver was afterwards determined in a salt prepared from an acid which had been submitted to recrystallization. ·2224 gram then yielded ·0842 gram Ag, or 37·86 per cent., almost exactly the theoretical quantity.

As this acid was the only product of the saponification discoverable in the alcoholic solution, and the formula of the crystalline principle rendered it very probable that it was an ethyl salt of this acid, a small quantity of the crystals was boiled with an aqueous solution of potash in a flask with an inverted condenser until decomposition and solution were effected. The amount of acid thus obtained confirmed this theory, and upon distilling the liquid, ethyl alcohol was readily detected in the distillate by Lieben's test, and by the production of aldehyde and acetic acid by its oxidation. The crystals therefore could be represented by the formula $C_2H_5C_{10}H_9O_3$.

Oxidation with Nitric Acid.—Boiled with dilute (1-3) nitric acid, the crystals dissolved slowly and with evolution of but little nitrous fumes. Upon cooling, the whole nearly solidified into a mass of delicate acicular crystals, which were removed, washed and dried. This acid was slightly soluble in cold water, more freely in boiling, melted at about 180° C., volatilization commencing a few degrees lower. The whole of the reactions showed it to be anisic acid, a conclusion confirmed by the estimation of the silver in its silver salt.

·0904 gram yielded ·0374 gram silver, or 41·37 per cent. Anisate of silver yields theoretically 41·70 per cent. of metal.

Anisic acid, $C_8H_8O_3$, being methylparaoxybenzoic acid, the acid $C_{10}H_{10}O_3$ is doubtless methylparaoxyphenylacrylic, or methylparacoumaric acid, and its ethyl salt will have the formula represented below.—



Methylparacoumaric acid has been prepared by Perkin by the action of acetic anhydride on anisic aldehyde in presence of sodium acetate, and appears to be identical with the acid obtained from the *Hedychium spicatum,* so far as the very small quantity at my disposal allowed me to proceed with the verification. I am not aware of the ethyl salt having previously been described, nor of either of these bodies having been found before in the vegetable kingdom.

As I purpose continuing my search for the odorous principle on receipt of a fresh supply of the rhizome, which is now on its way from India, the opportunity will be afforded for making such further examination of the two bodies just described as may seem desirable.

The uncrystallizable portion of the Petroleum Ether Residue.— This was found to consist of the odorous principle, a fixed oil and a very considerable proportion of ethylmethylparacoumarate, the latter doubtless prevented from crystallizing by the presence of the former. Upon saponification of the mixture with alcoholic potash, two crystalline acids were obtained, the methylparacoumaric and another, apparently a fatty acid. This latter was totally insoluble in boiling water, but crystallizable from alcohol. The quantity obtained did not enable me to identify it with certainty, and its further examination is reserved for the immediate future.

The odorous principle evidently exists in the rhizome in very minute proportion, and to isolate it in a state of purity will necessitate working on a much larger quantity of material.

A very minute quantity of the oily fluid above mentioned dropped upon the clothes renders them highly odorous for a considerable length of time, or if exposed causes a large room to be pervaded with its odour, which to me recalls that of hyacinths.

The proximate analysis of the rhizome gave the following results :—

Soluble in petroleum ether—		
Ethylmethylparacoumarate	3·0	5·9
Fixed oil and odorous body	2·9	
Soluble in alcohol—		
Indif. substance ppt. by tannin Acid resin, &c.		2·7
Soluble in water—		
Glucoside or saccharine matter		1·0
Mucilage		2·8
Albuminoids, organic acid, &c.		1·9
Starch		52·3
Moisture		13·6
Ash		4·6
Cellulose, &c.		15·2
		100·0”

Commerce.—The Indian drug is imported from Kumaon. The Chinese through Singapore. Value, Chinese, Rs. 4½ per maund of 37½ lbs. ; Indian, Rs. 5.

Kæmpferia rotunda *Linn., Jacq. Hort.* 3, *t.* 317 ; *Bot. Mag., t.* 920. Bhui-champa of India, does not yield any of the zedoaries of commerce. It is commonly cultivated in gardens on account of the beauty and fragrance of its flowers, which appear in the hot weather before the leaves spring up. The fresh tubers are pounded and applied by the natives to wounds, bruises, and swellings ; in Bombay they are used as a popular local application in mumps* (*Galgand*), but as they are generally combined with more active remedies, such as Croton seed, Aconite, and Nux Vomica, it is probable that they do not contribute much to the cure. The root consists of several central almost globular rhizomes, from which proceed numerous, thick, fleshy rootlets, all of which terminate in small, oblong, or round tubers; the substance of the rhizomes and tubers is of a pale straw colour, and has a bitter, pungent, camphoraceous taste, much like that of true zedoary; the whole plant is aromatic.

Elettaria Cardamomum, *Maton., Bentl. and Trim., t.* 267. The fruit.

Vernacular. — Iláyechí (*Hind.*), Iláchi (*Beng.*), Elakáy, Elaká (*Tam.*), Elchí, Veldode (*Bomb.*)

History, Uses, &c.—Cardamoms, in Sanskrit Ela, are mentioned by Susruta, and must consequently have been used by the Hindus from a very remote period. When they were first introduced into Europe is doubtful, as their identity with the amomum and cardamomum of the Greeks and Romans cannot be proved. Garcia thinks that the amomum of the ancients was the Hamáma of the Arabs, a drug still to be found in the Bombay shops, and which apppears to be a species of Sphagnum; it is figured in Clusius. The early Arabian writers were undoubtedly acquainted with either the true cardamom or the Ceylon cardamom. More recent Mahometan writers treat of cardamoms under the names of Kákulah and Híl. Muhammad Husain gives Kátídáús as the Greek, and Sharfiyún and Shusma as the Syrian synonyms. He describes two kinds, *Sighár* (small), and *Kibár* (great), and tells us that the greater kind is called the male, and the lesser the female cardamom. Other names for the lesser cardamom are *Shumshur*, *Khair-*

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* Tuberous roots were used by the ancients for the same purpose. Conf. Scrib. Larg. Comp. 44.

buva, Hil-buva and *Shúshmir.* Garcia d'Orta was acquainted with both the Ceylon and Malabar cardamoms. As a masticatory the Malabar cardamom only is used in India; it is an article of great importance to the natives, the seeds being constantly in use as a stimulant, and for flavouring food. Dr. Emerson records that cardamoms fried and mixed with mastiche and milk, are used internally in irritation of the bladder. Drury tells us (Useful Plants, p. 192,) that cardamoms are either cultivated or gathered wild. In the Travancore forests they are found at elevations of 3,000 to 5,000 feet. The mode of obtaining them is to clear the forests of trees, when the plants spontaneously grow up in the cleared ground. In four years the shrub will have attained its full height, when the fruit is produced and gathered in the month of November, requiring no other preparation than drying in the sun. The plant continues to yield fruit till the seventh year, when the stem is cut down, new plants arising from the stumps. In the Bombay Presidency the cardamom is largely cultivated in Soonda. For further particulars upon the cultivation of the plant, confer. Pharmacographia, p. 583, *et seq.*

Description.—The cardamom of commerce is a dry, three-sided, oblong, or roundish capsule of a yellowish-brown or dirty white colour. The pericarp is tough, and divides into three valves, from the middle of the inner surface of each a partition projects towards the axis, so as to divide the capsule into three cells, each of which is filled with closely packed angular seeds, each surrounded by a thin transparent membrane (aril). The seeds are of a rich brown colour, about two lines long, transversely rugose, with a depressed hilum, and deeply channelled raphé. The capsule is almost tasteless. The seeds have a pungent, camphoraceous, agreeable flavour, and leave a sensation of cold upon the tongue when chewed.

Microscopic structure.—The testa of the seed is formed of three layers; 1*st,* a layer of thick-walled striated cells; 2*nd,* a layer of large thin-walled cells; 3*rd,* an internal layer of dark-brown radiating cells, with very thick walls. The albumen is colourless and consists of polyhedral cells containing starch, and generally rhomboidal masses of albuminous matter, which can be easily seen when thin slices of the albumen in almond oil are examined by polarized light.

Chemical composition.—The parenchyme of the albumen and embryo is loaded with fatty oil and essential oil, the former existing in the seed to the extent of about 10 %. The essential oil, which amounts on an average to 4·6 per cent., has the odour and flavour of the seeds; it consists chiefly of a liquid having the formula $C^{10} H^{22} O^3$. According to Flückiger the raw oil is dextrogyre, and deposits after a time a camphor which he considers to be identical with common camphor, as it agrees with that substance in optical properties and crystalline form. The water which comes over when cardamoms are distilled, contains acetic acid. The ash of cardamoms, in common with that of several other plants of the same order, is remarkably rich in manganese.

Commerce.—The exports of cardamoms from Bombay in 1881-82 were 105,468 lbs., valued at Rs. 3,41,813, half to Europe, and half to Eastern ports. The different kinds of true cardamoms sold in this market are—Kaghazí, from Compta, Rs. 125 to Rs. 150 per maund of 37½ lbs.; Petí-kí (*i.e.*, Box cardamons), from Telicherry, Rs. 100 to Rs. 120; Malabarí, from Malabar Coast, Rs. 130 to Rs. 140. Ceylon cardamoms are also imported, but not in great quantity. Value, Rs. 115 to Rs. 125. They are used in the preparation of sweetmeats.

Other kinds of Cardamom.

Besides the Malabar cardamom, the seeds of Amomum xanthioides, *Wallich*, are met with in the Bombay market; these seeds are always deprived of their capsule; in form they hardly differ from those of the true cardamom, but they are less aromatic. The commercial name is Iláchídánah. Value, Rs. 75 to Rs. 90 per maund of 37½ lbs.

The Barí-iláchí, or Bengal cardamom, is also well known in this market; it is the fruit of the Amomum subulatum of

Roxburgh. It is much larger than the true cardamom, of a dark-brown colour and coarsely striated, three-valved, each valve being furnished with three ragged, membranous wings, which extend from the upper part of the fruit and gradually disappear towards the apex. The seeds are arranged as in the true cardamom, but are more numerous, and are held together in each cell by a dark viscid saccharine pulp. Their taste is aromatic and camphoraceous. They are much used in the preparation of sweetmeats on account of their cheapness.

Value, Rs. 12 per maund of 37½ lbs.

ORCHIDACEÆ.

Orchis and Eulophia. Several species. Salep.

Vernacular.—Saalab-misrí (*Hind.*), Shálá-mishirí (*Tam.*), Sálam-misrí (*Bomb.*), Chálé-michhrí (*Beng.*)

History, Uses &c.—Eulophia campestris, *Lindl.*, and Eulophia herbacea, *Lindl.*, are generally named as species which produce at any rate a portion of Oriental Salep, but we have no complete information upon the subject. E. herbacea and several other species of Eulophia are natives of the Bombay Presidency, but although some of their tubers are sold by the herbalists as Sálam-misrí, they do not yield any of the Saleps of Bombay commerce; these are all imported from Persia, Cabul, and Northern India, and are probably obtained from various species of Orchis. Salep does not appear to be mentioned in the old Sanskrit works on medicine. Mahometan writers usually describe it under the Arabic name of Khusyu-uth-thaalab (Foxes' Testicles); they identify it with the Sáturiyún and Turphullon of the Greeks, and mention several kinds.* The odour of the fresh root is said to resemble that of semen hominis, and to have an aphrodisiac effect if clasped in the hand. The dry tuber has a great reputation in the East as a nervine restorative and fattener. It is also much prescribed in paralytic affections. The palmate tubers are most esteemed. The nature of Oriental Salep appears to have been unknown in Europe until Geoffroy in 1740 discovered its source, and showed how it might be prepared from the tubers of orchises indigenous to France.

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* Compare with Dioscorides iii., 132. *περὶ ορχεως*, 133, *περὶ ορχεως ἑτέρου*, 134, *περὶ σατυρίου*, 135, *περὶ σατυρίου ἐρυθρονίου.*

Description.—Three kinds of Salep are generally to be met with in Bombay, *viz.*, Palmate, large ovoid, and small ovoid threaded, all of them are more or less translucent and gum-like, and have been decorticated before being dried. Salep has hardly any odour or taste ; with water it forms a bulky jelly, having a faint peculiar flavour. In the East it is mixed with milk, and flavoured with spices and sugar.

Microscopic structure.—The bulk of the tuber consists of a parenchyme, the cells of which contain either mucilage or starch altered by heat ; it is traversed by small fibro-vascular bundles.

Chemical composition.—The following summary is extracted from the Pharmacographia:—" The most important constituent of Salep is a sort of mucilage, the proportion of which, accord- to Dragendorff (1865), amounts to 48 per cent.; but it is doubtless subject to great variation. Salep yields this mucilage to cold water, forming a solution which is turned blue by iodine, and mixes clearly with neutral acetate of lead like gum arabic. On addition of ammonia an abundant precipitate is formed. Mucilage of Salep precipitated by alcohol and then dried, is coloured violet or blue, if moistened with a solution of iodine in iodide of potassium. The dry mucilage is readily soluble in ammoniacal solution of oxide of copper ; when boiled with nitric acid, oxalic, but not mucic, acid is produced. In these two respects, the mucilage of Salep agrees with cellulose, rather than with gum arabic. In the large cells in which it is contained, it does not exhibit any stratification, so that its formation does not appear due to a metamorphosis of the cell wall itself. Mucilage of Salep contains some nitrogen and inorganic matter, of which it is with difficulty deprived by repeated preciptation by alcohol.

It is to the mucilage just described that Salep chiefly owes its power of forming with even 40 parts of water a thick jelly, which becomes still thicker on addition of magnesia or borax. The starch however assists in the formation of this jelly; yet its amount is very small, or even *nil* in the tuber bearing the flowering stem, whereas the young lateral tuber abounds in it. The starch so deposited is evidently consumed in the subsequent period of vegetation, thus explaining the fact that tubers are found the decoction of which is not rendered blue by iodine. Salep contains also sugar and albumin, and when fresh, a trace of volatile oil. Dried at 110° C., it yields 2 per cent. of ash, consisting chiefly of phosphates and chlorides of potassium and calcium." (Dragendorff.) (Pharmacographia, page 594.)

Commerce.—The following kinds of Salep are met with in the Bombay market:—Abushaherí or Lasaniya, Rs. 15 to 35 per maund of 41 lbs.; Panjábí, Rs. 2½ per lb.; Panjah-i-sálab, (Palmate Salep, Persian), Rs. 5 to 10 per lb.

Besides these imitation Salep is largely prepared; it is said to be made of pounded potatoes and gum.

Padshah Salep. This dry bulb is brought for sale in small quantities by Cabulies, who come to Bombay in the cold season; two varieties are met with, dark-brown and white; both are about the size of a walnut. Mr. N. M. Khansahib informs me that they are the pseudo-bulbs of Pholidota imbricata, and that he has seen the plant growing in the Bangalore garden. The bulbs have a disagreeable mucilaginous taste; they are supposed to have the same properties as Salep.

Singh-rukh. The horn-like pseudo-bulbs of an orchid with grass-like leaves have been received under this name as medicinal.

Vanda Roxburghii, *R. Br.*, *Bot. Reg.*, *t.* 506. The roots.

Vernacular.—Rásná (*Hind.*, *Beng.* and *Bomb.*)

History, Uses, &c.—Dutt informs us that the roots of Vanda Roxburghii and Acampe papillosa are indiscriminately used as Rásna by native physicians in Bengal. The drug is mentioned by Sanskrit writers under the names of Rásná and Gandhanákuli, and is said to be bitter and aromatic and useful in rheumatism; it is given internally and applied externally. The following form for internal administration is found in most Sanskrit works on Medicine:—

RÁSNÁPANCHAKA.—Take of Rásná, Tinospora cordifolia, wood of Pinus longifolia, Ginger, root of Ricinus communis, of each equal parts, and prepare a decoction in the usual manner. (Confer. Dutt's Hindu Materia Medica, p. 259.) In the Concans the roots of Saccolabium papillosum, *Lindl.*, are used; this I suppose to be the same plant as the Acampe papillosa mentioned by Dutt.

Description.—Vanda Roxburghii has a creeping stem sending forth long, thick, round, ramous, fleshy, whitish roots, which fasten firmly to the trunk or branches of the tree they grow on. The plants are seldom more than two or three feet in length. Leaves sheathing, bifarious, approximate, recurved, linear, keeled, præmorse, five or six inches long; scape generally axillary, solitary, naked, supporting from 6 to 12 large beautiful flowers; petals 5, nearly equal, expanding, oblong; margins waved, and here and there a little inflected, upper surface checkered with yellow and dusky ferruginous purple, underneath white; lip shorter than the petals; horn conical, protruding towards the germ, between the two lower petals; lamina oblong, turgid; apex two lobed; sides reflex, so as to be convex above, and deeply concave underneath; colour bluish purple or violet towards the apex; the upper lip or portion which forms the attachment of the lip and horn to the base of the column of the fructification, has two lateral lobes, obliquely broad, lanceolate, with their acute points incurved towards the apex of the column; column of the fructification thick, short and obtuse, open in the interior margin near the apex. This mouth or opening tapers down through the column into a point which ends in the belly of the germ; operculum sub-orbicular, with two pits for the two round polliniferous balls; when the lid is removed gently the two anthers rise with a jerk in their broad cordate filaments; the lid is inserted on the interior parts of the top of the column by a large infundibuliform base. If removed with less care, and before the anthers are ripe, they remain in their cells, and the funnel-shaped base of the filament rises erect, stigma or channel for conveying the subtile male essence to the germ, a clammy opening in the fore part of the column near its tops; pericarpium clavate, with six sharp ridges running the whole length. (Roxburgh.)

SACCOLABIUM PAPILLOSUM, *Lindl., Bot. Reg., t.* 1552, now ACAMPE PAPILLOSA, *Lindl.* Leaves strap-shaped, unequally 2-lobed at the apex; peduncles much shorter than the leaves; sepals and petals subspathulate; sepals equal, larger than the petals; lip 3-lobed, lateral lobes short, obtuse, middle one sub-orbicular, saccate at the base; flowers yellow, transversely streaked with purple; lip white, transversely streaked with rose colour; flowers very stiff and fleshy. (*Bombay Flora.*) *Vern.*—Kánbher (*Bomb.*)

Commerce.—The bazar Rásna is sold at Rs. 2 per maund of 41 lbs. A small kind of Rásna is also sold at a very high price, *viz.*, Re $\frac{1}{4}$ per tolá (180 grs.); it does not apear to be the root of an orchidaceous plant. (See Tylophora asthmatica.)

IRIDEÆ.

Iris germanica, *Linn., Bot. Mag.* 670. The rhizome.

Vernacular.—Bíkh-i-banafshah (*Pers.*), Irsá (*Arab.*), Keore-ká-múl (*Bomb.* and *Hind.*)

History, Uses, &c.—Orris root is not mentioned by the older Hindu physicians. Mahometan writers mention several kinds of Iris under the names of Irsá and Súsán, but their descriptions are not sufficiently accurate to enable us to identify them with any certainty. From Mír Muhammad Husain's account (confer. Makhzan, article "Súsán,") I conclude that both the Iris fœtidissima, *L.*, the *ζυρις* of Dioscorides and Iris pseudoacorus, *L.*, the *νερόκρινος* of the modern Greeks are used medicinally in Persia. The correct Persian for I. germanica appears to be Súsán-i-ásmánjúní. The word Súsán is said to be derived from the Syrian Súsání. Irsá is evidently a corruption of the Greek Iris.* Iris root is considered by Mahometan hakíms to be deobstruent, aperient, diuretic, especially useful in removing bilious obstructions. It is also used externally as an application to small sores and pimples. From the large number of diseases in which this drug is recommended, it would appear to be regarded as useful in most diseases. (Confer. Makhzan, article "Irsá.") According to Hooker, Iris germanica is cultivated in Kashmir.

Description.—Indian Orris root differs from the European drug, inasmuch as the bark of the rhizome has not been removed; it is also small and badly preserved.

Microscopic structure.—The rhizomes of different species of Iris hardly differ in structure. They consist of a brown epidermis composed of compressed and nearly empty cells, covering a white cortical cellular tissue containing starch; this is separated by a layer of brownish compressed empty cells from the central woody yellowish tissue of the rhizome. The latter is built up of large thick-walled, spherical, porous cells, loaded with starch; here and there between the cells may be seen a prism of oxalate of lime. The vascular bundles are numerous, in each irregular rings of spiral vessels surround a central bundle of jointed vessels.

Chemical composition.—The following summary is extracted from the Pharmacographia:—"When Orris root is distilled with water, a solid crystalline substance, called *Orris Camphor*, is found floating on the aqueous distillate. This substance, which we obtained from the laboratory of Messrs. Herrings & Co., of London, is yielded, as we learn from Mr. Umney, to the extent of 0·12 per cent., that is to say, 3 cwt. 3 qrs. 23 lbs. of rhizome afforded of it 8½ ounces. Messrs. Schimmel & Co., of Leipzig, also presented us with the same substance, of which they obtain usually 0·60 to 0·80 per cent. Orris camphor has the exquisite and persistent fragrance of the drug; we have proved that this presumed stearoptene or Camphor of Orris root consists of *myristic acid*, $C^{14} H^{28} O^{2}$, impregnated with the minute quantity of essential oil occurring in the drug. The oil itself would appear not to pre-exist in the living root, but to be formed on drying it.

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* Compare with Dioscorides *περὶ ἴριδός* (i., 1.)

"By exhausting Orris root with spirit of wine, a soft brownish resin is obtained, together with a little tannic matter. The resin has a slightly acrid taste, the tannin strikes a green colour with persalts of iron." (Pharmacographia, p. 601.)

Commerce.—Bombay is supplied with Orris root from Persia and Kashmir. Value, annas 2 per lb.

Iris sp? Lakrí-pashánbed, or pakhánbed, is a rhizome, found in all the bazars, the prefix 'lakrí' (wood) being added to distinguish it from the mineral known as Pakhanbed.

The drug occurs in pieces 1 to 2 inches long, and about ½ an inch in diameter. The external surface is scaly with numerous circular constrictions, of a reddish-brown colour, marked with small scars, to a few of which rootlets remain attached; substance hard, compact, of a dull red colour. When soaked in glycerine it stains it of a rich reddish-brown. The taste is acrid and astringent; the odour musky and aromatic. The minute structure of the rhizome has a general resemblance to that of Orris root, but numerous stellate raphides are present. The drug is chiefly used as a diuretic. It is also believed to be an antidote for Opium (dose grs. 15). It is said to come from Thibet. Value, Rs. 3½ per maund of 41 lbs.

Crocus sativus, *Linn.*, *Bentl. and Trim.*, *t.* 274. The stigmata.

Vernacular.—Késar (*Hind.*, *Beng.* and *Bomb.*), Kungumpu (*Tam.*)

History, Uses, &c.—The Saffron Crocus appears to have been introduced into Kashmir from Persia. Early Sanskrit works on medicine do not notice the drug; in more recent books the Sanskrit name is Kumkum or Saurab. It is the κροκος of the Greeks.* From early Arabian writers we learn that the plant was cultivated at Derband and Ispahan in the 10th century. Chinese writers inform us that it was introduced into China by the Mahometans in the time of the Yuen dynasty (A. D. 1280-1368). (Confer. Pharmacographia, p. 602.) The author of the Makhzan says that Saffron is produced in Mazenderan, at a village called Báwa-koh, or vulgarly Báku, also in Istihbánát and Gilán in Persia; he considers the Kashmir saffron to be the best. The Persian and Kashmir saffrons are now seldom met with in Bombay; they have been driven out of the market by the superior saffrons of Europe and China. Native physicians consider saffron to be invigorating and preservative of the humours of the body, also diuretic, astringent, aphrodisiac, deobstruent, and emmenagogue. It is recommended in a vast number of diseases, and is used both externally and internally. In Persia a ball of saffron about the size of a walnut is worn sometimes by women over the belly to ensure speedy delivery and expulsion of the after-birth. Pessaries of saffron are also used in painful affections of the uterus. The Persian books on Materia Medica give Larkímás as the Persian name for the drug, but Zaafarán is the name by which it is best known both in Arabic and Persian.

Description.—Saffron consists of a small portion of the style and three long tubular stigmas of a rich orange colour; the upper extremity of each stigma spreads out to form a flat lamina with a dentate border. The stigmas simply dried and thrown together loosely, form the ordinary hay saffron of commerce. Persian saffron is, with the aid of some sticky material, pressed together so as to form a thin round flat cake; it is known in Bombay as Késar-kí-rotí (bread saffron).

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* Conf. Dios. i., 25.

Chemical composition.—Flückiger and Hanbury have the following summary:—" The splendid colouring matter of saffron has long been known as *Polychroit*; but in 1851, Quadrat, who instituted some fresh researches on the drug, gave it the name of *Crocin*, which was also adopted in 1858 by Rochleder. The experiments of Weiss in 1867 have shown:—

1*st*—That this substance (Polychroit, Crocin of Rochleder,) is a peculiar glucoside which, by the action of acids, splits into sugar, volatile oil and a new colouring matter.

2*nd*—That saffron contains only a minute quantity of ready-formed essential oil and sugar.

3*rd*—That this free essential oil is probably identical with that which is produced in the decomposition of polychroit.

4*th*—That polychroit, as hitherto prepared, has always contained a certain proportion of the new colouring matter produced by decomposition."

For the natural glucoside, Weiss retains the name of Polychroit, while the new colouring matter which results from its decomposition by an acid, he terms Crocin. It agrees with the Crocetin of Rochleder.

Polychroit was prepared by Weiss in the following manner:—" Saffron was treated with ether, by which fat, wax, and essential oil were removed, and it was then exhausted with water. From the aqueous solution, gummy matters and some inorganic salts were precipitated by strong alcohol. After the separation of these substances, polychroit was precipitated by addition of ether. Thus obtained, it is an orange-red, viscid, deliquescent substance, which, dried over sulphuric acid, becomes brittle and of a fine ruby colour. It has a sweetish taste, but is devoid of odour, readily soluble in spirit of wine or water, and sparingly in absolute alcohol. By dilute acids, it is decomposed into Crocin, sugar, and an aromatic volatile oil having the smell of saffron. Weiss gives the following formula for this decomposition:—

$$\underset{\text{Polychroit}}{C^{48}H^{60}O^{18}} + H^{2}O = 2\,(\underset{\text{Crocin}}{C^{16}H^{18}O^{6}}) + \underset{\text{Essential oil}}{C^{10}H^{14}O} + \underset{\text{Sugar.}}{C^{6}H^{12}O^{6}}$$

Crocin is a red powder, insoluble in ether, easily soluble in alcohol, and precipitable from this solution on addition of ether. It is only slightly soluble in water, but freely in an alkaline solution, from which an acid precipitates it in purple-red flocks. Strong sulphuric and nitric acids occasion the same colours as with polychroit, the former producing deep blue, changing to violet and brown, and the latter green, yellow, and finally brown. It is remarkable that hydrocarbons of the benzol class do not dissolve the colouring matter of saffron.

"The oil obtained by decomposing crocin is heavier than water; it boils at about 209° C., and is easily altered, even by water. It is probably identical with the volatile oil obtainable to the extent of one per cent. from the drug itself, and to which its odour is due.

"Saffron contains sugar (glucose?) besides that obtained by the decomposition of polychroit. It leaves after incineration 5 to 6 per cent. of ash." (Pharmacographia, p. 604.)

The investigation of the characteristic constituents of saffron, which has previously occupied the attention of several chemists, has been taken up by Herr Kayser (*Berichte*, xvii., 2228). By distilling saffron suspended in water in a current of carbonic anhydride, shaking the distillate with ether, and evaporating the ether in a current of carbonic anhydride, the essential oil was obtained as a very mobile, scarcely yellowish coloured liquid, having an extremely intense odour of saffron, readily becoming thick and brown by absorption of oxygen from the atmosphere, and giving upon analysis figures corresponding with the formula $C_{10}\,H_{16}$. Crocin was obtained by treating an aqueous extract, made without heat from saffron previously exhausted with ether, with purified animal charcoal, which removed all the colouring matter; then filtering, washing and drying the charcoal, boiling it with 90 per cent. alcohol and filtering. Upon removal of the alcohol the crocin was left as a brittle yellow-brown mass, yielding a pure yellow powder, freely soluble in water and dilute alcohol, less soluble in absolute alcohol, and giving up only traces to ether. With concentrated sulphuric acid it gave a deep blue solution, passing to violet, cherry red and finally to brown; with nitric acid a deep blue, passing almost immediately to brown; with hydrochloric acid it underwent no change of colour. Acetate of lead produced no precipitate in a solution of crocin in the cold, but on warming the solution, decomposition at once took place, and the liquid then reduced Fehling's solution. As previous workers used lead acetate in the separation of crocin, Herr Kayser supposes that their product always contained crocetin. He attributes to pure crocin the formula $C_{44}H_{70}O_{28}$ and to crocetin $C_{34}H_{46}O_{9}$, the decomposition being represented by the following equation :—

$$2\,C_{44}H_{70}O_{28} + 7\,H_2O = C_{34}H_{46}O_9 + 9\,C_6H_{12}O_6.$$

An ethereal extract of the residual saffron yielded a crystalline bitter substance, freely soluble in water and alcohol, less easily in chloroform and ether, and melting at 75°. This has been named "picrocrocin," and is represented by the formula $C_{38}H_{61}O_{17}$. It presents the interesting character that when warmed in aqueous solution with lead acetate, lime or baryta water or acid it splits up into sugar and an essential oil, which has a strong odour of saffron and the composition of a terpene.

Commerce.—Saffron is imported into Bombay from France, and occasionally from China. Value, Rs. 22 per lb.

French saffron is frequently adulterated; a sample examined by Lyon (1875) gave Water 9·48, Organic matter 56·93, Mineral matter (chiefly Carb. of Lime) 33·59. This adulteration is easily detected by placing a pinch of the saffron in water, when the viscid substance used to make the lime adhere to it dissolves, and the lime falls to the bottom of the glass.

PALMÆ.

Cocos nucifera, *Linn., Rheede Hort. Mal., i. tt.* 1 *to* 4; *Roxb. Cor. Pl.* 1, *t.* 73. The oil and sap.

Vernacular.—Nariyal-ka-pér(*Hind.*),Naral-cha-jháda(*Bomb.*), Narikél-gachh (*Beng.*), Tenna-maram (*Tam.*)

History, Uses, &c.—The Cocoanut, in Sanskrit Narikela, is probably indigenous to Southern India; its numerous economical uses naturally attracted the attention of the earliest travellers in this part of the world.* A detailed account of them, which would be out of place here, may be found in Drury's "Useful Plants of India," and in many other standard works. Hindu and Mahometan medical writers ascribe medicinal virtues to various parts of the tree and several of its products, but the oil and sap only are of any considerable importance. From the former a very cheap hard white soap is prepared, suitable for such pharmaceutical purposes as plaster making and the preparation of soap liniment; the latter fermented and distilled yields a good clean spirit. A tumbler full of the fresh juice is sometimes taken early in the morning on account of its refrigerant and slightly aperient properties. Cocoanut oil has been tried in Europe as a substitute for cod liver oil, but its indigestibility is a great drawback to its general use. In the Concan the oil which separates from the freshly rasped kernel, alone or mixed with tamarind seed oil, is used under the name of *Mutel,* as an application to bruises or rheumatic swellings; sometimes black pepper is added to it.

Description.—Cocoanut oil is a pale yellow oil, which in cold weather concretes into a white butter. One part of it boiled with a caustic soda solution will form from 2 to 3 parts of a hard, white soap, perfectly soluble in alcohol. The oil, and the soap in a less degree, has a faint characteristic odour. The spirit if properly rectified is free from disagreeable smell, but as prepared in the common native still is unfit for pharmaceutical purposes.

Chemical composition.—Solidified cocoanut oil melts at 20° C., melted it solidifies at 18° C. When kept for some minutes at a temperature of 240° C. it remains fluid for 48 hours. It soon becomes rancid, and consists of a glyceride which has been called Cocinine, or cocinate of glycerine, but which, according to Oudemans, is a mixture of several glycerides. He has moreover shown that the fatty acid of the oil consists principally of lauric acid, melting at 43° C., mixed with palmitic acid melting at 62° C., and myristic acid melting at 53·8° C. The oil also yields by saponification caproic and caprylic acids. It contains no oleic acid.

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* Supposed to be the *κουκιόφόρον* (*δένδρον*) of Theophrastus H. P. iv., 2.

Commerce.—The value of cocoanut oil in Bombay ranges from Rs. 16 to 20 per cwt. The soap is obtainable for Rs. 16 per cwt. Inferior qualities containing a large amount of water are sold as low as Rs. 8 to 10. The exports of oil in 1881-82 amounted to 13,728 gallons to eastern ports, and the imports to 10,360 gallons from Ceylon. 265,832 cocoanuts were imported, and 238,195 exported. 2,461 cwts. of dried kernel was exported.

Borassus flabelliformis, *Linn., Rheede Hort. Mal. i., tt.* 9 *and* 10; *Roxb. Cor. Pl.* 1, *t.* 71, Tala, Trinarája (*Sans.*), Tál (*Hind.* and *Beng.*), Tár (*Bomb.*), Panai-maram (*Tam.*), affords a large quantity of spirit, which is equal in quality to that obtained from the cocoanut. Native writers ascribe medicinal properties to various parts of the tree, but none of them appear to be of much importance. The fine brown silky substance on the young petioles of this and other Palms is used as a styptic.

Phœnix sylvestris, *Roxb., Rheede Hort. Mal. iii., tt.* 22 *to* 25, Kharjura (*Sans.*), Kajúr (*Hind.* and *Beng.*), Sendí (*Bomb.*), Ishan-chedi (*Tam.*), also yields a sap, from which spirit is obtained. The fruit called *Khárik* pounded and mixed with almonds, Quince seeds, Pistachio nuts, spices, and sugar forms a *Paushtik,* or restorative remedy much in vogue. A paste formed of the seeds and the root of Achyranthes aspera is eaten with betel leaves as a remedy for ague.

Areca Catechu, *Linn.*, *Roxb. Cor. Pl.* 1, *t.* 75; *Bentl. and Trim.*, *t.* 276. The kernel.

Vernacular.—Suparí (*Hind.*, *Beng.* and *Bomb.*), Kamugu, Pakku (*Tam.*)

History, Uses, &c.—The betelnut, in Sanskrit Guvaka, Puga, or Kramuka, is a masticatory of great antiquity in the East. It is mentioned in Chinese works written before the Christian era under the name Pin-lang, supposed to be a corruption of its Malay name Pinang. (Confer. Pharmacographia, p. 607.) The Arabs call it Fúfal, a corruption of the Persian Púpal, said to be another form of the Hindi word Kubar कुबड, hump-backed. Hindu and Mahometan writers describe betelnut as aphrodisiac and astringent, and recommend it in calculous affections. When masticated it is thought to sweeten the breath, strengthen the gums, prevent perspiration, and act as a stimulant and astringent upon the whole body. The unripe nuts are said to be laxative. The ripe nuts have recently been introduced into European practice as an anthelmintic.

Description—The betelnut has the shape of a very short-rounded cone, scarcely an inch in height; it is depressed at the centre of the base. The testa, which seems to be partially adherent to the endocarp, is obscurely defined, and inseparable from the nucleus. Its surface is marked with a network of veins, running chiefly from the hilum; these veins extend into the white albumen, giving the seed a strong resemblance to a nutmeg. The small conical embryo is situated at the base. The ripe nut is feebly astringent. Caustic lye turns the brown portion red. Unripe betelnuts which have been boiled are known as red betel or *chikni suparí,* and an extract which is obtained from the water in which they have been boiled is called *supárí che phúl,* and is often given to women along with powdered Red betel and other spices after confinement as a gentle stimulant.

Chemical composition.—The authors of the Pharmacographia say :—" We have exhausted the powder of the seeds, previously dried at 100° C., with ether, and thereby obtained a colourless solution, which after evaporation left an oily liquid, concreting on cooling. This fatty matter, representing 14 per cent. of the seed, was thoroughly crystalline, and melted at 39° C. By saponification, we obtained from it a crystalline fatty acid fusing at 41° C., which may consequently be a mixture of lauric and myristic acids. Some of the fatty matter was boiled with water ; the water on evaporation afforded an extremely small trace of tannin but no crystals, which, had catechin been present, should have been left.

"The powdered seeds which had been treated with ether, were then exhausted by cold spirit of wine (·832), which afforded 14·77 per cent. (reckoned on the original seeds) of a red amorphous tannic matter, which, after drying, proved to be but little soluble in water, whether cold or boiling. Submitted to destructive distillation, it afforded pyrocatechin. Its aqueous solution is not altered by ferrous sulphate, unless an alkali is added, when it assumes a violet hue, with separation of a copious dark purplish precipitate. On addition of a ferric salt in minute quantity to the aqueous solution of the tannic matter, a fine green tint is produced, quickly turning brown by a further addition of the test, and violet by an alkali. An abundant dark precipitate is also formed.

"The seeds having been exhausted by both ether and spirit of wine, were treated with water, which removed from them chiefly mucilage precipitable by alcohol. The alcohol thus used afforded on filtration, traces of an acid, the examination of which was not pursued. After exhaustion with ether, spirit of wine and water, a dark brown solution is got by digesting the residue in ammonia; from this solution, an acid throws down an abundant brown precipitate, not soluble in boiling alcohol. We have not been able to obtain crystals from an aqueous decoction of the seeds, nor by exhausting them directly with boiling spirit of wine. We have come therefore to the conclusion that catechin is not a constituent of areca nuts, and that any extract made from them must be essentially different to the catechu of Acacia or of Nauclea, and rather to be considered a kind of tannic matter of the nature of Ratanhia-red or Cinchona-red.

"By incinerating the powdered seeds, 2·26 per cent. were obtained of a brown ash, which, besides peroxide of iron, contained phosphate of magnesium." (Pharmacographia, p. 608.)

Commerce.—The kinds of betelnut met with in Bombay are:—

Gowai, from Goa, value, Rs. 40 to Rs. 50 per candy of 5¼ cwt.
Mangalore, value, Rs. 70 to Rs. 110 per candy.
Rupasai, from Alpai, Rs. 60 to Rs. 80 per candy.
Calcutta, value, Rs. 60 to Rs. 65 per candy.
Asigree, from Singapore, value, Rs. 60 to Rs. 70 per candy.
Kanarese, value, Rs. 80 to Rs. 100 per candy of 5¼ cwt.
Severdani, ,, 4½ ,, 4¾ per ¼ cwt.

All these are known as white betelnut. The following kinds of red betelnut are met with:—

Malabari, value, Rs. 70 to Rs. 80 per candy of 5¼ cwt.
Koompta, ,, 60 ,, 90 ,,
Marorkadi, ,, 80 ,, 85 ,,
Goa, ,, 65 ,, 90 ,,
Wasai, from Bassein, value, Rs. 6 to Rs. 8 per ¼ cwt.
Sewali, value, Rs. 5 per maund of ¼ cwt.
Malwan, value, Rs. 60 to Rs. 65 per candy of 5¼ cwt.
Vingorla, ,, 60 ,, 65 ,,
Calcutta, ,, 50 ,, 60 ,,

Bombay exports about 800,000 lbs. yearly, the greater part of which goes to China and the east-coast of Africa.

Lodoicea seychellarum, *Labill.*, *Bot. Mag.* 2734-5-6-7-8. The nut.

Vernacular.—Daryá-ka-nariyal (*Hind.*), Kadat-rengáy (*Tam.*), Jahari-naral (*Bomb.*)

History, Uses, &c.—Prior to the discovery of the Seychelles Islands in 1743, the large and pecular-shaped nut of this palm, found floating in the Indian Ocean, was an object of curiosity which gave rise to many fabulous tales; it was called Sea Cocoanut and Coco-de-mer, by Europeans, Narjíl-bahrí by the Arabs, Narjíl-i-daryaí by the Persians, and important medicinal virtues were attributed to it. It is now no longer valued by Europeans, but is still in great repute among the Arabs and Indians as a tonic, preservative, and alexipharmic. In Bombay it is prescribed in conjunction with the Lignum colubrinum as a tonic and febrifuge.

Description.—Thomas Moore, in the Treasury of Botany, tells us that—"This magnificent palm, which is found only in two small islands, Praslin and Curieuse, belonging to the Seychelles group, requires a great length of time to arrive at maturity. The shortest period before it puts forth its flower-buds is thirty years, and a hundred years elapse before it attains its full growth. From the age of 15 to 25 years it is in its greatest beauty, the leaves at this period being much longer than they are subsequently. The stem grows quite upright, straight as an iron pillar, and in the male trees frequently attains a hundred feet in height, the females being shorter. At the age of thirty it first puts forth its blossoms, the males forming enormous catkins about three feet in length and three inches in diameter, while the females are set upon a strong zigzag stalk, from which hang four or five, or sometimes as many as eleven nuts, averaging about 40 lbs. weight each. From the time of flowering to the maturation of the fruit, a period of nearly ten years elapses, the full size however being attained in about four years, at which time it is soft and full of a semi-transparent jelly-like substance. The apparently peculiar formation of the root portion of this tree attracted much attention a few years since, but upon comparison with other palms it seems to be explained as an extraordinary development of a common system. The base of the stem is rounded and fits into a natural bowl or socket, which is pierced with hundreds of small oval holes about the size of a thimble, with hollow tubes corresponding on the outside, through which the roots penetrate the ground on all sides, never however becoming attached to the bowl, their partial elascity affording an almost imperceptible but very necessary 'play' to the parent stem when struggling against the force of violent gales. This bowl is of the same substance as the shell of the nut, only much thicker; it rots very slowly, for it has been found quite perfect and entire in every respect sixty years after the tree has been cut down." The fruits are covered externally with a thick fibrous husk, and contain usually one, but sometimes two or even three immense nuts with hard thick black shells, each being divided half way down into two lobes. The kernel is from three-quarters to one inch thick and very hard and white, having much the consistence of vegetable ivory; it has no odour or taste; when soaked in water it softens a little, and can be split into thin fibrous bundles.

Microscopic structure.—The kernel is composed of spindle-shaped cells having a central cavity, from which club-shaped canals extend to the cell wall, where they are opposed to similar canals belonging to a neighbouring cell.

Commerce.—The nuts are now an article of export from the Seychelles; hundreds of them may be seen at Port Victoria, Mahé, whither they are brought from the island of Praslin. Value in Bombay, Re. 1¼ per lb. for the dry kernel.

Entire nuts fetch from Re. 1 to Rs. 2 each, according to their size.

Calamus Draco, *Willd.* The resin.

Vernacular.—Dam-el-akhwain (*Arab.*), Híra-dakhan (*Bomb.*), Híra-dukhí (*Hind.*)

History, Uses, &c.—The original Dragon's blood of commerce was not derived from this plant. The older writers upon eastern commerce speak of Dragon's blood as an export to the East from Arabia and Socotra. Ibn Batuta, who visited Java and Sumatra between 1325 and 1349, makes no mention of this substance among the products of those islands. Barbosa, writing in 1514, speaks of Dragon's blood as a product of Socotra, but makes no mention of it amongst the drugs found in Malacca, Java, Sumatra, or Borneo. (Confer. Parmacographia, p. 610.) Rumphius is the first who describes the mode of preparation followed at Palembang to procure this drug. It appears that the resin exudes in abundance from the fruit, and, being very brittle, is easily detached by shaking and friction, finally it is exposed to a heat sufficient to make it form a uniform mass. An inferior quality is said to be extracted from the crushed fruit by boiling.

Dragon's blood is used medicinally in India, chiefly by the Mahometans, as an astringent. It is given internally in diarrhœa and dysentery, and is used as an astringent application to the eyes. The Arabic names are Dam-el-akhwain (blood of the two brothers), Dam-et-tinnin and Dam-eth-thuaban (Dragon's blood), and Kátir-ed-dam (gummy distillations of blood). The Persians call it Khún-i-siyawashân (blood of incestuous lovers). Siyawash, the father of Cyrus, is said to have been in love with his step-mother. The Bombay name is apparently a corruption of the Hindí Híra-dukhí.

Description.—Lump Dragon's blood only is imported into Bombay from the East : it occurs in large blocks of irregular form, it differs from Socotra Dragon's blood in containing remains of the fruit, and numerous scales. Its fracture is somewhat porous, but in good samples the colour is nearly as brilliant as that of the drops from Socotra.

Chemical composition.—The following summary is taken from the Pharmacographia :—" Dragon's blood is a peculiar resin, which, according to Johnston, answers to the formula $C^{20} H^{20} O^{4}$. By heating it and condensing the vapour, an aqueous acid liquid is obtained, together with a heavy oily portion of a pungent burning taste, and crystals of benzoic acid. The composition of these products has not yet been thoroughly ascertained, but the presence of acetone, Toluol $C^{6} H^{5} (CH^{3})$, Dracyl of Glénard and Boudault (1844), and Styrol, $C^{8} H^{8}$ (Draconyl), has been pointed out, the latter perhaps due to the existence in the drug of metastyrol, as suggested by Kovalewsky. Both these hydrocarbons are lighter than water, yet we find that the above oily portion yielded by dry distillation, sinks in water, a circumstance possibly occasioned by the presence of benzoic alcohol, $C^{6} H^{5} (CH^{2} OH.)$

" As benzoic acid is freely soluble in petroleum ether, it ought to be removed from the drug by that solvent ; on making the experiment we got traces of an amorphous red matter, a little of an oily liquid, but nothing crystalline. Cinnamic acid, on the other hand, is always present, according to Hirschsohn (1877). As to the watery liquid, it assumes a blue colour on addition of perchloride of iron, whence it would appear to contain phenol or pyrogallol, rather than pyrocatechin.

" By boiling Dragon's blood with nitric acid, benzoic, nitrobenzoic, and oxalic acids are chiefly obtained, and only very little picric acid. Hlasiwetz and Barth melted the drug with caustic potash and found among the products thus formed, phloroglucin, para-oxybenzoic, protocatechuic and oxalic acids, as well as several acids of the fatty series. Benzoin yields similar products." (Parmacographia, 2nd. Ed., p. 674.) A very complete investigation of the properties of the various kinds of Dragon-blood has been made by Messrs. Dobbie and Henderson (see Pharm. Journ. Nov. 10th 1883). They say: — " Our results may be summed up as follows: There are at least four distinct kinds of red resin presently sold as dragon's blood, or labelled in collections under that name. One variety is brick-red in colour, melts at about 80° C., gives off red-coloured highly irritating fumes when decomposed by heat, dissolves readily with an orange-red colour in alcohol, ether, chloroform, carbon bisulphide and benzene, is insoluble or only slightly soluble in cold caustic soda, ammonia, lime water and sodium carbonate, and dissolves with difficulty when boiled in these reagents. Its alcoholic solution has an acid reaction and gives a brown-red coloured precipitate when mixed with a solution of lead acetate. Its composition may be represented by the formula $C_{18}\ H_{18}\ O_4$. This is undoubtedly the resin of *Calamus Draco,* some of the specimens which were examined having their origin well authenticated.

" A second variety is of a beautiful carmine-red colour, melts about 100° C., gives off non-irritating fumes when decomposed by heat, dissolves freely with a pink colour in alcohol, ether and chloroform, but is insoluble in carbon bisulphide and benzene, dissolves readily in cold caustic soda, ammonia and sodium carbonate, and much more readily than the foregoing in lime water. Its alcoholic solution has an acid reaction and gives a lilac-coloured precipitate with lead acetate. Its composition may be represented by the formula $C_{17} H_{19} O_5$. The source of this resin is quite uncertain. We have no means of determining whether it is identical with any hitherto described variety of red resin. The specimens examined are marked as having come from the Dutch East Indies, but beyond this we know nothing of their origin.

"A third variety is of a vermilion colour, melts about 80° C., gives off aromatic irritating fumes when decomposed by heat, dissolves with a blood-red colour in alcohol and ether, but is insoluble in chloroform, carbon bisulphide and benzene, dissolves readily in cold caustic soda, ammonia, lime water and sodium carbonate. Its alcoholic solution has an acid reaction and gives with lead acetate a mauve-coloured precipitate. Its composition may be represented by the formula $C_{18} H_{18} O_4$. This is the resin from a species of *Dracœna.* One of the specimens examined is from *Dracœna Cinnabari,* Socotra, and as it was gathered by Professor Balfour there can be no doubt as to its origin. Another specimen is from *Dracœna Draco,* and its origin is also well authenticated. The other specimens examined are marked some of them *Calamus,* but there can be little doubt that this is a mistake, and that all the resins having the properties just enumerated are derived from species of *Dracœna.* It seems certain then that the resin derived from *Dracœna sp.* is totally different in property from that derived from *Calamus sp.*

"The fourth variety is a mixture, in varying proportions, of a reddish-brown coloured resin, freely soluble in carbon bisulphide, and a light brick-red coloured resin, nearly insoluble in carbon bisulphide. The two portions also differ considerably as regards their solubility in ether, benzene, and other reagents, the dark portion being in all cases the less soluble of the two. Since, however, it dissolves to a slight extent in all reagents we found it impossible to effect a complete separation of the two portions. The portion freely soluble in carbon bisulphide is probably identical with the resins of our first class, while the other portion seems to be a distinct resin.

"Much discussion has taken place with regard to the presence of a volatile acid in dragon's blood. It seems certain that none of the varieties of this resin contain benzoic acid; at all events we failed to obtain an extract from any of them with petroleum ether, in which benzoic acid is freely soluble. We tested for cinnamic acid by sublimation, and found it present in the resins of the first and third classes, but not in those of the second and fourth classes. To ascertain the delicacy of this method we made a preliminary experiment with artificial mixtures containing 1 per cent. of cinnamic acid, and found that the acid could be separated out by sublimation from very small quantities of such a mixture. Probably the error as to the presence of benzoic acid arose through confounding it with cinnamic acid, or possibly from working with a resin in which benzoic acid had been formed by partial oxidation."

Commerce.—The drug comes to Bombay from Singapore. Value, annas 9 to Re. 1½ per lb. according to quality.

Socotra Dragon's Blood. Dracœna Cinnabari. *Balfour f.* This is the Cinnabar of Dioscorides,* and the original Dam-el-akhwain of the Arabs. It is now only met with occasionally in small parcels in this market. It may at once be distinguished by its occurring in tears, the surface of which is covered by a dull red powder. When broken the substance is glassy, translucent, and of a beautiful garnet colour. Imitation tears are manufactured in Bombay from common Dragon's blood; they may easily be detected by their wanting the glassy fracture of the genuine article. Hildebrandt has ascertained that Zanzibar Dragon's blood is obtained from the stems of Dracœna Schizantha, *Baker*. The natives remove pieces of the bark about 2 inches square, and the cavity in 2 to 3 weeks' time becomes filled with the resin. In Zanzibar it is used in ophthalmia, and is said to be called "Macziwa ya watu wawili," meaning the milk of two men, or "Matcho ya watu wawili," the eyes of two men. In Socotra, according to Wellsted, the Dragon's blood is called by the natives "Edah" (ايدع) and by the Arabs "Khoheil," and is taken by them to Muscat, reaching Europe occasionally by way of Bombay. Professor Bayley Balfour, who visited Socotra a few years ago to examine the fauna and flora of the island, was the first to give us any exact information concerning the species of Dracœ̈na yielding Dragon's blood in Socotra, and the way in which it is collected. He says, the resin exudes most abundantly immediately after the rainy season, the natives collect it by chipping it off with a knife into a small bit of skin placed against the tree ; there are different qualities collected. First the large tears, which are the best and most expensive, and are called *Edah amsal* (ايدع امثل best Edah), 2*nd*, small portions which become detached, forming powdery Dragon's blood or *Edah dukkah* (ايدع دقه Edah dust), 3*rd*, an inferior kind obtained by melting the refuse into cakes called *Edah mikdehah* (ايدع مقدحه Edah of the ladle).

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* Compare with Dios. v., 63. *περὶ κινναβάρεως*, and Pliny 33, 7. The former notices its being called Dragon's blood; both distinguish it from Minium.

AROIDEÆ.

Pistia stratiotes, *Linn.*, *Rheede Hort. Mal. xi., t.* 32; *Roxb. Cor. Pl.* 3, *t.* 268. *Vernacular.*—Jal-kunbhí (*Hind.*), Prashní, Gondála (*Bomb.*) This aquatic plant is a native of Asia, America and Africa ; it is considered by the Hindus to be cooling and demulcent, and is prescribed in cases of dysuria in the quantity of about ten pagodas weight twice daily ; the leaves are made into a poultice for the piles. (Ainslie.) The ashes are applied to ringworm of the scalp, and in some parts of India are known as 'Páná salt.'

Description.—Often found floating on stagnant pools, leaves sub-rotund, obcordate, rosulate, waved on the margins, the nerves spreading like a fan, uniting into a truncate arc at the base; spadices axillary, solitary, seated on a short scape.

This plant will be found noticed in Arabic and Persian works under its Greek name στρᾶτιώτης.

Chemical composition.—The plant and salt have been examined by Warden of Calcutta, who reports that the weed dried at 130° C. and carbonized yielded 31 per cent. of total ash, of which 6 per cent. was soluble. The sample of "salt" was slightly deliquescent, alkaline in reaction, and had the appearance of dirty common salt. Dried at 130° it yielded 73 per cent. of potassic chloride, 22·6 per cent. of potassic sulphate, and minute quantities of potassic carbonate, sodic chloride, calcic sulphate, magnesic sulphate, and ferric, aluminic and silicic oxides. (*Chem. News*, March 23, p. 133.)

Scindapsus pertusus, *Schott., Rheede Hort. Mal. xii., t.* 20, 21.

Syn.—Pothos pertusa, *Roxb.*

Vernacular.—Ghannaskánda (*Mar.*)

A large perennial plant, running over trees and rooting on them like Ivy; leaves alternate, resembling those of the Pipal (Ficus religiosa) but larger, often perforated and cut in the margins; spadices shortly-peduncled; spathe gibbous, acute, a little longer than the spadix; spadix cylindric-obtuse. The juice of the plant with black pepper is given to people who have been bitten by the *Kusreyia Ghannas,** a snake so called because the part bitten by it mortifies. The juice, with that of the roots of Croton oblongifolium and of the fruit of Momordica Charantia is also applied to the bitten part.

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* The Daboia Russellii, a viper.

Acorus Calamus, *Linn.*, *Rheede Hort. Mal. xi.*, *t.* 48; *Bentl. and Trim.*, *t.* 279. The rhizome.

Vernacular.—Bacha, Bach (*Hind* and *Beng.*), Vekhand, Gora-vach (*Bomb.*). Persian var. Bál-vach, Bál-vekhand (*Bomb.*)

History, Uses, &c.—This plant, originally a native of Central Asia, is now established in most parts of Europe; it is the Vachá of Sanskrit writers. The Arabs call it Waj and Úd-el-waj, evidently corrupted forms of the Sanskrit name. Some consider it to be identical with the Calamus aromaticus of Dioscorides, but against this we have the authority of the Persian writers, who state that the *Kalum armatik* of the Romans was a kind of chirretta; Royle would have it to be an Andropogon. Dr. Hill and others think it is the Acoron of Dioscorides,* which Adams says is indisputably the Acorus pseud-acorus. The Calamus aromaticus of mediæval writers was doubtless Acorus Calamus. The Hindus consider the sweet flag to be emetic in large, and carminative, stimulant and tonic in small doses. As an emetic a dram and a half to two drams is given in a tumbler full of warm salt and water; as a tonic it is usually combined with other bitters and aromatics; as a stimulant it is added to other remedies in paralytic and nervous affections. The Mahometans describe it as deobstruent and depurative, useful for the expulsion of the phelgmatic humours, which they suppose to be the cause of paralysis, dropsy and many other diseases; they recommend it to be given to children to bite when teething, and prescribe it internally in calculous affections. It has also a reputation as a diuretic, emmenagogue and aphrodisiac, and is applied in the form of poultice to paralysed limbs and rheumatic swellings. A pessary composed of Acorus, saffron and mare's milk is used to promote delivery; a hip bath of the decoction is also said to be efficient for this purpose. Dr. Ondaatji, Colonial Surgeon of Ceylon, has brought to notice the use of sweet flag as an anthelmintic in that island. He says: "An infusion of the rhizome given to young children acts effectually, as I have seen many such cases treated among the natives." Dr. Evers at the Seoni Main Dispensary has found the drug very effectual in dysentery. He uses the following decoction:—Bruised rhizome 2 ozs., Coriander 1 drm., Black pepper ½ drm., Water one pint. Boil down to 12 ounces, and let cool. Dose for an adult 1 ounce three times a day; for a child 1 to 3 drams, sweetened with sugar, two or three times a day. He also says:— "The decoction is not only useful in dysentery and diarrhœa, but also in the bronchitic affections of children." I have often taken it myself when suffering from a bad cold in the chest. (*Ind. Med. Gazette,* Feb. 1875.)

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* Compare with Dios. i., 2. *περὶ ακόρου.*

The evidence collected by Dr. Watt for his Economic Dictionary testifies to the value of Acorus as an aromatic bitter and stimulant, especially useful in allaying distressing cough.

Description.—The root stock occurs in somewhat tortuous, sub-cylindrical or flattened pieces, of variable length; to the upper surface of these is attached the lower portion of the leaves which have been cut off; on the under surface may be seen a zigzag line of little elevated dot-like rings, the scars of roots. The root-stock is usually rough and shrunken, varying in colour from dark brown to orange brown, breaking easily with a short corky fracture, and exhibiting a whitish spongy interior. The odour is aromatic and agreeable; the taste bitterish and pungent. The Persian variety of Acorus is darker in colour when fractured and has a more powerful odour, the leaves have been entirely removed, instead of being cut off short.

Microscopic structure.—A section of the rhizome is like an open network composed of rows of nearly round cells and open spaces (water passages); most of the cells contain small starch granules, but some of them essential oil; at the junction of the cortical and central portions of the rhizome is a very distinct row of small empty cells. The vascular bundles are numerous, especially just within the line of small cells just noticed; each bundle consists of a ring of spiral vessels surrounding a number of jointed tubes.

Chemical composition.—The following summary is taken from the Pharmacographia:—"The dried rhizome yielded us 1·3 per cent. of a yellowish neutral essential oil of agreeable odour, which in a column of 50 mm. long deviates the ray of polarized light 13·8° to the right. By working on a large scale, Messrs. Schimmel & Co., of Leipzig, obtained 2·4 to 2·6 per cent. According to Kurbatow (1873) this oil contains a hydrocarbon, $C^{10}H^{16}$, boiling at 159° C., and forming a crystalline compound with H. Cl., and another hydrocarbon boiling at 255—258° C., affording no crystallizable hydrochloric compound. By submitting the oil to fractional distillation, we noticed, above 250°, a blue portion, which may be decolourized by sodium. The crude oil acquires a dark brownish colour on addition of perchloride of iron, but is not at all soluble in concentrated potash solution.

The bitter principle, Acorin, was isolated by Faust in 1867, as a semi-fluid, brownish glucoside, containing nitrogen, soluble both in ether and in alcohol, but neither in benzol nor in water. In order to obtain this substance, we precipitated the decoction of 10 lbs. of the drug by means of tannic acid, and followed the method commonly practised in the preparation of bitter principles. By finally exhausting the residue with chloroform, we succeeded in obtaining a very bitter, perfectly crystalline body, but in so minute a quantity, that we were unable to investigate its nature." (Pharmacographia, 2nd Ed., p. 678.)

Commerce.—The Gora-vach sold in Bombay is brought from Northern India. Value, Rs. 3 per maund of 37½ lbs.

The other variety (Bál-vekhand) comes from Persia and is rather more expensive.

Amorphophallus campanulatus, *Blume, Roxb. Cor. Pl.* 3, *t.* 272; *Bot. Mag, t.* 2812, Janglí súran (*Bomb.*), has a tuberous, root which when peeled and cut into segments is sold in the shops under the name of Madan-mast. The segments are usually threaded upon a string, and are about as large as those of an orange, of a reddish brown colour, shrunken and wrinkled, brittle and hard in dry weather; the surface is mammilated. When soaked in water they swell up and become very soft and friable, developing a sickly smell. A microscopic examination shows that the root is almost entirely composed of starch. Madan-mast has a mucilaginous taste, and is faintly bitter and acrid; it is supposed to have restorative powers and is in much request; it is fried in ghí with spices and sugar. The cultivated variety of the plant is largely used as a vegetable; under cultivation it loses most of its acridity and grows to an enormous size. It has a reputation as a remedy for piles, hence the Sanskrit synonym Arsaghna.

Synantherias sylvatica, *Schott.*

Syn.—Arum sylvaticum, *Roxb.*

Vernacular.—Uzomut (*Goa.*), Wajrmut (*Mar.*), a large aroid growing at Asnora in the Goa territory, and in all parts of the Southern Concan. The country people use the crushed seed to cure toothache, a small quantity is placed in the hollow tooth and covered with cotton; it rapidly benumbs the nerve; they also use it as an external application to bruises on account of its benumbing effect. In the Concan the seeds rubbed into a paste with water are applied repeatedly to remove glandular enlargements. The fruit is yellow, about the shape and size of a grain of maize, closely set round the upper part of the spike, which is several feet in height, and as large as that of the plantain. The skin of the fruit is tough, the pulp scanty and yellow; it encloses two seeds having the shape of a coffee bean, and placed with their flat surfaces in apposition. The testa of the seed is soft, greenish-brown externally, green internally; the kernel is white, adhering closely to the testa, soft and juicy when fresh, but rapidly becoming hard and dry when cut. The taste is intensely acrid, after a few seconds it causes a most painful burning of the tongue and lips, which lasts for a long time, causing much salivation and subsequent numbness. A section of the fruit and seed show the following structure from without inwards—1*st*, several rows of thick-walled cells having yellowish brown granular contents (skin); 2*nd*, a parenchyma composed of thin-walled cells having no solid contents except needle-shaped crystals (pulp); 3*rd*, several rows of small cells containing chlorophyll (testa of seed); 4*th*, a delicate parenchyma the cells of which are loaded with very small starch granules, mostly round, some truncated.

Sauromatum pedatum, *Schott. Lk. et Ot.* 19, 8.

Vernacular.—Lot लोत (*Mar.*) This term is applied in the Concans to several species of this genus, much as the word *Arum* is used in Europe. From the Central Provinces, S. pedatum was received under the name of Bhasamkand. The tubers are as large as small potatoes, and of the same shape as those of the *Suran* (Amorphophallus campanulatus); they are very acrid and poisonous, and are only used externally as a stimulating poultice by the natives.

Colocasia antiquorum, *Schott., Rumph, Amb. v., tt.* 109, 110.

Vernacular.—Alú, Arwí, Kachu (*Hind.*, *Beng.* and *Bomb.*), Shemakalengu (*Tam.*)

History, Uses, &c.—The acrid juice of the petioles of several varieties of this species is a common domestic remedy on account of its styptic and astringent properties. The petiole is slightly roasted and the juice expressed. I have seen purulent discharge from the ears in children stopped by a single application. The tubers of these plants chopped fine, tied in a cloth and heated, are used as a fomentation in rheumatism.

Different varieties of this Colocasia are cultivated extensively in India and Egypt; they are all more or less acrid, but by cooking and the addition of acid fruits the acridity is almost removed. Hindus and Mahometans are very fond of all parts of these plants.

The name Colocasia, which is used by Greek and Latin writers, appears to be derived from the Coptic Kalkásí. Pliny (21, 15,) describes the plant as growing in Egypt, and says that all parts of it are eaten as a favourite food, but he confounds it with the Lotus, where he says that the fruit is the Egyptian Bean. It is the Kalkás of the Arabs, and is correctly figured by Vesling in his Commentary upon Prosper Alpinus, p. 38. This plant has a reputation among the Mahometans as being powerfully aphrodisiac. The flowers are sweet-scented, and are worn in the hair by women.

XYRIDEÆ.

Xyris indica, *Linn.*, Dadumari (*Sans.*), Dábi-dúba (*Hind.*), Cheena ghanza (*Beng.*), has a reputation as a cure for ringworm. Rheede says of it :— " Foliorum succus cum aceto mixtus impetigini resistit ; folia cum radice oleo incocta contra lepram sumantur ; cum mungo (Tordylium mungo) decocta et epota somnum consiliant. " Vahl and Gærtner give a similar account of it.

Description.—A rush-like plant, smooth ; peduncles round, grooved, sheathed by the leaf below ; leaves linear, ensiform, shorter than the peduncle, spikes elliptic, many-flowered ; scales broadly obovate, rounded at the apex, shining, smooth ; flowers yellow. *Hab.*—Salt marshes in the Southern Concan.

AMARYLLIDEÆ.

Hypoxis orchioides, *Willd.*, *Roxb. Cor. Pl.* 1, *t.* 13 ; *Bot. Mag.*, *t.* 1076. The root.

Syn.—Curculigo orchioides.

Vernacular.—Kalí-múslí, Múslí-kand (*Hind.*, *Beng.* and *Bomb.*), Nilap-panaik kizhangu (*Tam.*)

History, Uses, &c.—Both Hindu and Mahometan medical writers speak of a white and black Múslí, which from their description appear to have been different varieties of the same plant. The author of the Makhzan describes Múslí root as tapering and like the Egyptian Shakákul (Tordylum Shekakul); he says that some prefer the white kind and some the black. It is now impossible to say what the two kinds of Múslí mentioned by Sanskrit writers were, especially as the word *Múshli* means any tapering root, and is often loosely applied. At the present time we meet with a white and black Múslí in the shops, but derived from two entirely different plants, viz., the *white* from Asparagus adscendens and the *black* from Hypoxis orchioides. I have been favoured with a living specimen of the latter plant collected by Dr. B. B. Nené of Poona at Sitabaldi, and find that it exactly agrees with the black Múslí of the shops, while the roots of the species of Hypoxis found in the Concan though similar in structure are smaller than the commercial article, and are only sold locally by herbalists as Múslí. Native medical works give the following instructions for the collection of the drug: Two year old plants are to be selected, and the roots having been washed and cleared of rootlets, are to be sliced with a wooden knife, threaded upon a string and dried in the shade; when dry they may be powdered. The dose is 180 grains to be beaten up with an equal quantity of sugar in a small glass of water or milk until it forms a thick mucilage. Treatment to be continued for forty days, abstinence from mental and physical exercise being enjoined. Múslí is prescribed for asthma, piles, jaundice, diarrhœa, colic and gonorrhœa; it is considered to be demulcent, diuretic, tonic, and aphrodisiac, and is often combined with aromatics and bitters. Hakim Sharafeddín in his Mujarabát has the following anecdote in illustration of its tonic effects:—

من شروع بخوردن این دوا نمودم و پدر من جهت آنکه با زن خود
مقاربت نه نمایم مرا بریک جانب و زوجهٔ مرا بجانب دیگر خود میخوابانید
چون بیست روز از خوردن این دوا گذاشت از شدت قوت باه و شبق
نتوانستم صبر نمود شبی پای خودرا از بالای پدر دراز کرده زن خودرا
بران پاسوار نموده بدین طرف آوردم و با او مقاربت کرده باز برپا

سوار نموده بدانجانب فرستادم که دربین پاي من لغزش نمود و اندک فرود آمد و پای زن من بر شکم پدر رسید از خواب بیدار شد گفت اي ظالم چرا تا چهل روز صبر نکردي که این لغزش و ضعف هم نمیماند

The story at once suggests to the reader that in such cases چهل روز صبر is probably as good a tonic as Múslí.

Description.—Múslí occurs as short transverse sections of the root, half an inch or less in diameter, covered externally by a dark-brown bark; the substance of the root is opaque and greyish-brown; portions of the characteristic, wrinkled, vermicular rootlets may usually be found attached to some of the pieces. The taste is mucilaginous and slightly bitter.

Microscopic structure.—The fresh root of H. orchioides when cut across presents a firm milk-white, opaque surface, marked with numerous minute punctures. Thin sections show that it consists of a cortical and central portion, both composed mainly of a delicate parenchymatous tissue loaded with small starch granules, here and there a large cell contains a bundle of needle-shaped crystals. The large open passages which can be seen with the naked eye are almost entirely confined to the cortical portion; they are lined by the walls of the neighbouring cells. In the central column are numerous bundles of spiral vessels which are mostly situated near its junction with the cortical portion. Many of the starch granules are muller-shaped.

Chemical composition.—The drug has not been examined.

Commerce.—Most of the bazar Múslí comes from Rutlam in Guzerat, or from the Central Provinces. Value, Rs. 4 per maund of 37½ lbs.

Crinum asiaticum, var. toxicarium, *Herb., Bot. Mag.* 1073; *Bentl. and Trim., t.* 275. The bulb and leaves.

Vernacular.—Sukhdarsan (*Hind.*), Visha-mungil (*Tam.*), Nágdown (*Bomb.*), Gaer-honar-pata (*Beng.*)

History, Uses, &c.—I have not met with any account of this drug in native works on Materia Medica, nor does it appear to be used medicinally in Bombay, though the plant is very common. In the Concan the leaves smeared with mustard oil or *Mutel* are warmed and bound round inflamed joints. Ainslie informs us that the natives of Southern India bruise the leaves and mix them with a little castor oil, so forming an application which they think useful for repelling whitlows and other inflammations that come at the ends of the toes and fingers; also that the juice of the leaves is employed for earache in Upper India.* Rumphius, who calls it Radix toxicaria (Amb. II., p. 155, t. 69,) speaks highly of its virtues in curing the disease occasioned by the poisoned arrows of the Macassers in their wars; it is the root chewed, that is the emetic, provided a little of the juice is swallowed. The Crinum asiaticum is the Man-sy-lan of the Cochin-Chinese, and its virtues may be found lauded by Loureiro. (Ainslie, Mat. Ind., Vol. II., p. 464.) Sir W. O'Shaughnessy remarks (Bengal Disp., p. 656,) that this is the only indigenous and abundant emetic plant, of which he has experience, which acts without producing griping, purging, or other unpleasant symptoms. In the Pharmacopœia of India, the root has been made official as an emetic, nauseant and diaphoretic; directions for making a juice and syrup are given, the former to be given in doses of 2 to 4 fluid drachms every 20 minutes until emesis is produced. The latter in doses of 2 fluid drachms as a nauseant and emetic for children.

Description.—Caulescent or stemless; leaves linear-lanceolate, very smooth; margins entire, striated beneath, 3 to 4 feet long and 5 to 7 inches broad; scapes axillary, shorter than the leaves, a little compressed; flowers numerous, 12 to 50 in an umbel, white, almost inodorous; berries roundish, the size of a pigeon's egg. (Bomb. Flora, Pt. I., p. 275.) The root is bulbous, white, with a terminal stoloniferous fusiform portion issuing from the crown of the bulb; it varies greatly in size; odour narcotic and disagreeable.

Microscopic structure.—The central portion of the bulb (stoloniferous fusiform portion) consists of a parenchyma made up of polyhedral cells containing a little granular matter and some needle-shaped crystals; it is traversed by numerous bundles of jointed and spiral vessels; surrounding the central portion is a solid cortical layer less vascular than the central column; from both of these spring the subterraneous white bases of the leaves, which form the upper part of the bulb.

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* A well known popular use of the plant; the leaves are slightly roasted and the juice is then expressed, and a few drops poured into the ear.

Chemical composition—Nothing is known.

Commerce.—Not an article of commerce.

Crinum ornatum, C. latifolium *Roxb., Fl. Ind.*

Vernacular.—Gadambíkánda (*Bomb.*)

The bulb is extermely acrid, and is used for blistering cattle, a slice being bound upon the skin. When roasted it is used as a rubefacient in rheumatism.

Description.—Root a spherical, tunicated bulb; leaves numerous, radical, lanceolate, waved, smooth, tapering slowly from within a few inches of the base to rather a broad and obtuse point; margins scabrous with minute cartilaginous teeth, length 1 to 3 feet; scapes from the axils of the decayed leaves, somewhat compressed, 1 to 2 feet long; umbels with about 10 flowers; spathes two, of an ovate conic form, with many soft filaments among the flowers; flowers sessile, large, tube green, border very pale rose, almost white, faintly fragrant; corol tube declinate, cylindric, obscurely 3-sided, about 4 inches long; border campanulate, horizontal, segments lanceolar, with rather soft subulate points; length 3 to 4 inches; filaments six, inserted in the mouth of the tube, declinate; apices sharp and always erect; anthers falcate, incumbent and tremulous, pale yellowish grey; germ inferior, oblong, 3-celled with several ovula in each, attached in two vertical rows to the two lobes of the thick fleshy receptacles; style filiform, declinate, projecting beyond the stamina; stigma small, 3 toothed; pericarpium a soft somewhat fleshy perishable envelope which covers one, two, or three large fleshy bulbiform seeds.

LILIACEÆ.

Aloe abyssinica, *Lam.*, *Baker*, *Linn. Journ. xviii.*, 174. Jaafarabad Aloes.

Vernacular.—(All kinds of aloes) Elwa (*Hind.* and *Beng.*), Elia (*Bomb.*), Kariya-pólam (*Tam.*) (The plant) Koraphad (*Mar.*)

History, Uses, &c.—The Hindus would appear not to have been acquainted with the drug until it was introduced into India by the Mahometans, who learned its use from the Greeks.* Aloes was probably first prepared in Socotra. Masudi, who wrote in the 10th century, says that in his time the Socotrian drug was the only kind produced. (Confer. Pharmacographia, p. 617.) The manufacture afterwards spread to the neighbouring continents of Africa and Arabia, and lastly to India, but even at the present time the greater part of the aloes used in the latter country is imported from Africa and Arabia. The Hindus, though unacquainted with the drug aloes, appear to have been long ago aware of the properties of the plant, and to have been in the habit of using it medicinally under the names of Ghrita kumárí and Kanyá. Sanskrit writers describe the juice of the leaves as cathartic, cooling and tonic, useful in the treatment of fevers, enlarged glands, liver, spleen, and eye diseases. As an external application it is supposed to promote the granulation of wounds, and when rubbed beneath the navel to open the bowels of young children; it is also used to facilitate the extraction of the Guinea worm, and as an application to burns. A little of the juice with honey is commonly given to new-born children to hasten the expulsion of the meconium. In the Makhzan-el-Adwiya, four kinds of aloes are noticed, *viz.*, Socotrian, Bokharian or Persian, Indian, and Arabian; the latter is said to be often adulterated with Akákíá (extract of acacia pods) and Gum-arabic, but the Bokharian is pronounced to be the worst kind, and full of stones and dirt. Mahometan physicians describe aloes as aperient, deobstruent, depurative, anthelmintic and tonic; as a collyrium they consider that it strengthens the sight and removes styes of the lids; it is often applied for the dispersion of swellings and the promotion of granulations. They direct it to be purified in the following manner:—Take Socotrine Aloes 1 lb., powder and sift, then take wormwood, Jatamási, Chiretta, Cinnamon, Cassia, wood of the Balsam tree, Herba Schœnanthi, Asárum, Mastich, of each 3 dirhems, boil in 2 lbs. of water down to one pound and strain. Put the aloes into a mortar, rub it down with part of the above decoction and strain, repeat the process with the remainder of the decoction and any aloes remaining on the strainer, let the strained liquors subside, draw off the supernatant fluid, mix the aloes with 3 dirhems of saffron and preserve for use. In Anthony Colin's translation of Clusius, the following notice of aloes by Garcia d'Orta occurs:—" Les Indiens s'en servent en leurs collyres et aux medicamens purgatifs comme aussi és playes, lesquelles ils veulent remplir de chair pour lequel usage ils ont le plus souvent dedans leur boutiques un medicament composé de myrrhe ét aloes appellé par eux Mocebar (mussabar). J'ai vue un medecin du grand Sultan Badur Roy de Cambaya lequel usoit de l'herbe d'aloes pour medicament familier en ceste façon. Il faisoit cuire avec du sel les fueilles de l'herbe couppées, de telle decoction il en faisoit prendre huict onces lesquelles faisoyent vuider le ventre fort benignement et sans aucune extorsion quatre ou cinq fois. En ceste ville de Goa ils donnent en breuvage a ceux qui ont des ulceres aux reins ou en la vescie de l'aloe bien pulverisé et meslé avec du laict qui a si heureux succes et profit que les malades en sont incontinent gueris. Ils s'en servent aux Indes pour faire meurir les flegmons." In the same work there is a prescription for the use of fresh aloe leaves by Christophe de la Coste. Take of Aloe leaves sliced 3 ozs., salt 3 drms., heat to boiling over a gentle fire, strain and add 1 oz. of sugar Let the liquid cool, and take it cold early in the morning. The patient should be directed to keep moving about to promote the action of the medicine, and four hours after taking it some chicken broth may be given. The leaves and flower stalks of this aloe are pickled by the natives of Guzerat after having been soaked in salt and water.

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* Compare with Diosocorides iii., 23. περὶ αλόης.

Description.—Aloes is prepared from the species named at the head of this article at Jaafarabad, a town on the coast of Kattiawar, belonging to the Hubshis of Jinjíra, a family of African origin. The drug in mass is black; it has a glassy fracture; thin pieces are yellowish-brown and translucent; the powder is of a dull yellow; the odour powerfully aloetic, with an aroma like Socotrine aloes; when brought in contact with nitric acid it does not turn red. Its reaction is then the same as Socaloin. Jaafarabad Aloes is generally in the form of flat circular cakes. From Zanzibar an aloe is imported which very closely resembles Jaafarabad; it gives the same reaction with nitric acid.

Aloe Perryi, *Baker, Bot. Mag.* 6596.

Socotrine Aloes. This drug is imported into Bombay *viâ* Zanzibar and the Red Sea ports. It is packed in skins, the packages varying much in size and shape, and often containing a large proportion of rubbish, such as pieces of hide, stones, &c. In Bombay the skins are opened, and the aloes repacked in boxes for exportation to Europe. The best Socotrine aloes is of a golden-brown colour, hard externally, soft internally; the odour is aromatic and peculiar; when powdered or in thin fragments it is orange-brown, sometimes it is almost fluid. Baker tells us that it is called Tâyef in Socotra; when placed in the skins it is quite liquid, but gradually hardens. The juice is obtained by placing the cut ends of the leaves in a shallow excavation in the ground, into which a piece of skin has been pressed; it runs out in a few hours.

Yamani or **Moka Aloes**, also called Aden Aloes, is imported from Arabia, and is the kind most in use among the natives of this part of India. It varies much in quality. It is of a black colour in mass, and somewhat porous, but thin fragments are translucent and yellowish brown; the odour is powerfully aloetic, without the aroma of Socotrine or Jaafarabad Aloes; medicinally it appears to be sufficiently active. With nitric acid it gives a deep red colour, like Barbadoes; the solution in sulphuric acid is not affected by nitric acid fumes.

Chemical composition.—The following summary of the properties of aloes is taken from the Pharmacographia:—" All kinds of aloes have an odour of the same character and a bitter disagreeable taste. The odour, which is often not unpleasant, especially in Socotrine Aloes, is due to a volatile oil, which the drug contains only in minute proportion. T. and H. Smith, of Edinburgh, who contributed a specimen of it to the Vienna Exhibition of 1873, inform us that they obtained it by subjecting to distillation with water 400 lbs. of aloes, which quantity they estimate to have yielded about an ounce. The oil is stated in a letter we have received from them, to be a mobile pale yellow liquid, of sp. gr. 0·863, with a boiling point of 266° to 271° C.

" Pure aloes dissolves easily in spirit of wine with the exception of a few flocculi; it is insoluble in chloroform and bisulphide of carbon, as well as in the so-called petroleum ether, the most volatile portion of American petroleum. The specific gravity of fine transparent fragments of aloes, dried at 100° C., and weighed in the last named fluid at 16° C., was found by one of us (F.) to be 1·364, showing that aloes is much more ponderous than most of the resins, which seldom have a higher specific gravity than 1·00 to 1·10. In water, aloes dissolves completely only when heated. On cooling the aqueous solution, whether concentrated or dilute, becomes turbid by the separation of resinous drops, which unite into a brown mass, the so-called resin of aloes. The clear solution, after separation of this substance, has a slightly acid reaction; it is coloured dark-brown by alkalies, black by ferric chloride, and is precipitated yellowish-grey by neutral lead acetate. Cold water dissolves about half its weight of aloes, forming an acid liquid which exhibits similar reactions. The solution of aloes in potash or ammonia is precipitated by acids, but not by water." (*Op. cit.*, p. 686.)

The most interesting constituents of aloes are the substances known as Aloin, an account of which will be found in the Pharmacographia. The Aloin of Jaafarabad Aloes has recently (1882) been examined by W. A. Shenstone. About 1½ lb. of the powdered aloes was treated with enough proof-spirit to make a thin paste, and after standing for a few hours was enveloped in folds of stout calico and submitted to powerful pressure, by which means about 28 per cent. of crude Aloin was obtained. This was purified by twice crystallizing from water, then by crystallizing several times from dilute spirit, and finally by crystallizing twice or thrice from rectified spirit. Portions of the crops of crystals thus obtained were burnt with the following results:—

I. ·1104 gram. of aloin which had been once crystallized from rectified spirit and dried *in vacuo* over sulphuric acid gave ·2438 gram. of CO_2 and ·0561 gram. of H_2O.

II. ·1380 gram. of aloin which had been twice crystallized from rectified spirit and dried *in vacuo* over sulphuric acid gave ·3042 gram. of CO_2 and ·0696 gram. of H_2O. Corresponding to

	Carbon.	Hydrogen.	Oxygen.
I.	60·22	5·64	34·14
II.	60·11	5·60	34·29

The aloin therefore was evidently in a pure state. 1·2375 gram. of pure air-dried aloin dried over sulphuric acid in a vacuum lost ·1987 gram. of water, corresponding to 16·0 per cent.

When bromine water was added in excess to an aqueous solution of the aloin, a copious yellow precipitate fell. This was collected after having been in contact with excess of bromine water for an hour, washed, dried, and crystallized three times from spirit. The brominated aloin was in beautiful yellow crystals, which were rather soluble in cold alcohol, and were somewhat more stable than the aloin itself. It retained only a trace of water when dried in a vacuum over sulphuric acid, which was given off on heating to 100° C. to 110° C. .2526 gram. of the perfectly dry substance gave ·2539 gram. of silver bromide, corresponding to 42·75 per cent. of bromine.

In 1875, Dr. Tilden proposed, as the result of the consideration of a number of analyses of aloins and their derivatives made by himself and others, that the aloins obtained from Barbadoes and Zanzibar aloes might be considered isomeric bodies, with the empirical formula $C_{16}H_{18}O_7$, which also agrees closely with his analysis of nataloin. This formula requires 59·62 per cent. of carbon and 5·59 per cent. of hydrogen. Its tribromo-derivative requires 42·93 per cent. of bromine.

It will be seen that of the numbers obtained in Mr. Shenstone's analysis, those for the hydrogen and bromine agree very closely with these, and that the proportion of carbon, though a little high, also agrees fairly well.

The water of crystallization found, 16 per cent., is rather more than the amount which would correspond to three molecules, *i.e.*, 14·3 per cent. The difficulty of getting air-dried aloin of constant composition, however, is so great that the result is not of much value.

The following comparative observations with Jaafarabad aloin and Dr. Tilden's zanaloin were made:—

There is no distinguishable difference in the crystalline form of the two aloins.

Neither of them gives any change of colour in the cold when moistened with ordinary strong nitric acid; both of them are reddened by fuming nitric acid. And the Jaafarabad aloin, by prolonged treatment with nitric acid, yields chrysammic, aloetic, picric, and oxalic acids as zanaloin and barbaloin do.

Jaafarabad aloin, when treated with potassium chlorate in a hydrochloric acid solution, yields a chloro-body resembling that given by zanaloin, and when heated with acetic anhydride gives an acetyl compound similar to acetyl-zanaloin.

Both of them, when treated with strong sulphuric acid and potassium bichromate, give a violet colouration closely resembling that given by strychnia, but quickly fading to green.

These results seem to leave no doubt that the aloin of Jaafarabad aloes is identical with that from Zanzibar aloes, though the colour of the former is distinctly a lighter shade of yellow than that of the latter.

The main points of difference among the aloins may be tabulated thus :—

1. Nataloin, obtained from Natal aloes, yields only picric and oxalic acids by treatment with nitric acid. Is not reddened, even on heating, by that re-agent.

2. Barbaloins, yield chrysammic, aloetic, picric, and oxalic acids by treatment with nitric acid. They may be divided into—

(A) *a*-barbaloin, obtained from Barbadoes or Moka aloes. Is reddened in the cold by ordinary strong nitric acid.

(B) *b*-barbaloin, obtained from Socotrine, Zanzibar, and Jaafarabad aloes. Is not coloured by cold nitric acid, but gives an orange-red colouration when heated with it, and also gives a colouration in the cold with fuming nitric acid. (Shenstone in Phar. Journ., Dec., 1882.)

Commerce.—Socotrine aloes, value, Rs. 14 to Rs. 18 per maund of 41 lbs. ; Jaafarabad, Rs. 7 to Rs. 10; Moka, Rs. 7 to Rs. 8 ; Zanzibar, Rs. 5 to Rs. 7.

The imports of all kinds of aloes into Bombay in 1880-81 were 1,022 cwts., and in 1881-82, 991 cwts.

Urginea indica, *Kunth.*, *Wight Ic.*, *t.* 2063. The bulb.

Vernacular.—Kánde, Jangli-piyáj (*Hind.* and *Beng.*), Kol-Kánda, Kochinda (*Bomb.*), Nari-vengayam (*Tam.*)

History, Uses, &c.—The Hindus use the bulb in the preparation of *Chándi-bhasma* or 'Ashes of Silver,' which they use medicinally. The properties of squills were well known to the Greeks, who prescribed the drug combined with vinegar and honey, much as we do at the present time.* The Arabians appear to have followed closely in the footsteps of the Greek physicians, as their writers on Materia Medica mention the preparations used by them. Indian Mahometan writers evidently consider the Indian squill as identical in medicinal properties with the squill of the Greeks; they prescribe it in paralytic affections, also as an expectorant, digestive, diuretic, deobstruent, and emmenagogue in many diseases, more especially in asthma, dropsy, rheumatism, calculous affections, leprosy, and skin diseases. The Arabic name for the genus is Basl-el-'ansal or Basl-el-fár, the Persian Piyáz-i-dashtí. European physicians in India have expressed various opinions as to the medicinal activity of Urginea indica (confer. Phar. of India, p. 241), but there would appear to be no doubt that the young freshly-dried bulbs are sufficiently active, as they have been used for many years at the Government Store Depôt at Bombay for making the various preparations of the drug.

Description.—The Urginea indica is very abundant in sandy ground near Bombay; the dirty white spike of flowers appears long before the leaves. The bulb is tunicated, consisting of fleshy coats, which enclose each other completely, generally about the size of a common onion; colour white; taste bitter and acrid.

Microscopic structure.—Each scale or modified leaf is made up of polyhedral cells covered on both sides by an epidermis provided with stomata; like a leaf, it has vascular bundles. The cells of the parenchyma are loaded with mucilage, and contain an enormous quantity of needle-shaped crystals and a few large square or oblong prisms. The presence of the former accounts for the itching of the hands experienced by those employed to slice the bulb.

Chemical composition.—I am not aware of any chemical examination of this species of squill having been made.

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* Compare with Dioscorides ii., 162. *περὶ σκίλλας.*

Commerce.—The entire bulb is kept in all druggist's shops, this being the form preferred in native practice.* At the same time a considerable quantity is sliced and dried for use as a substitute for the squills prescribed by natives who follow the practice of European medicine.

Value, 1 to 2 annas per lb., according to quality.

Asphodelus fistulosus, *Linn.*, *Sibthorp Fl. Græc.*, *t.* 335.

Vernacular.—Piazí, Bokhat, Binghar-bíj (*Punj.*, *Sind.*)

History, Uses, &c.—The plant has a reputation in Sind and the Punjab as a diuretic, and the seeds are sold in the shops; it is very abundant in cultivated ground about Jhelam and in Southern Afghanistan. (Murray, Watt.) Sibthorp describes it as common near Athens. In Northern India and Afghanistan it is eaten as a vegetable in times of scarcity, just as several closely allied plants are in the Concans. Hesiod, who wrote about 800 B. C., when he enjoins temperance and simplicity of living in his "Works and Days," says (ver. 30)—

νήπιοι. οὐδὲ ἴσασιν, ὅσῳ πλέον ἥμισυ παντὸς
οὐδ' ὅσον ἐν μαλάχῃ τε καὶ ἀσφοδέλῳ μέγ' ὄνειάρ.

How much is the half better than the whole! How great a blessing is there in Mallows and Asphodel! Theophrastus, in his History of Plants (Lib. viii.), tells us that Asphodel roots were eaten by the Greeks, and an Asphodel is described by Dioscorides† as a medicinal plant having diuretic and deobstruent properties when given internally, and being useful as an external application to ulcers and inflamed parts, &c. The Romans called the same plant '*Hastula regia*,' or king's spear. Arabic and Persian writers on Materia Medica describe an Asphodel with white flowers under the name of Khunsa (خنثي), the same, or a very similar plant is called Ashrásh, or Saresh in Persian; Ibn Sina says اصل الخنثی هو الاشراش. To this plant they attribute the same properties as Dioscorides does to Asphodel (confer. Tuhfat-el-muminín, article خنثی) with some additions.

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* Compare with Dioscorides on the method of baking squills; also Scrib. Comp., 76, as a remedy for asthma.

† Dios. ii., 159

Description.—Annual, stem naked, ramous; leaves erect, linear, cylindric, fistulous, tapering to a point; scape erect, branched; flowers small, white with a brownish line running along the centre; filaments ciliate, contracted; corol 6-partite; stigma capitate; ovary 3-celled.

Polianthes tuberosa, *Linn., Bot. Mag., t.* 1817; *Bot. Reg., t.* 63.

Vernacular.—Gulshabbo, Gulchérí (*Hind.* and *Bomb.*), Rajanígandha (*Beng.*) The Tuberose of the English, the Fulla pipa of the Portuguese, and the Amica nocturna of Rumphius (Amb. V., t 98), a common garden flower, considered by the natives to be hot and dry, diuretic and emetic. The bulbs are used as a remedy for gonorrhœa. In the Concan they are rubbed with turmeric and butter and applied to remove वट्या (Watiya), small red pimples which often trouble new-born children. They are also rubbed into a paste with the juice of Durva grass (Cynodon dactylon) and applied to buboes. The tuberose is much valued on account of its perfume, for which it is cultivated in France; the flower is one of those which sometimes emit phosphorescent flashes of light in the night.

Gloriosa superba, *Linn., Rheede Hort. Mal. vii., t.* 57; *Bot. Reg., t.* 77. The tuberous root.

Vernacular.—Lángulí, Karihárí, Kulhárí (*Hind.*), Bishalángulí (*Beng.*), Indai, Nágkaria (*Bomb.*), Kalaippaik-kizhangu (*Tam.*)

History, Uses, &c.—This plant, in Sanskrit Lángalika, Agnisikha and Kalikári, is one of the seven minor poisons of the old

Hindu physicians. Dutt informs us that it is sometimes called Garbhaghatini, or the abortive, in Sanskrit, but says that he has never known it used for criminal purposes. In Hindu medicine a paste made from the fresh root is applied to the navel and supra-pubic region to promote labour pains, or assist in the expulsion of the placenta; sometimes the application is made to the palms of the hands and soles of the feet. The starch obtained from the root by washing is given internally in gonorrhœa.

In the Talíf-i-sharífí, and some other Indian Mahometan works on Materia Medica, the plant will be found noticed under the names of Languli and Kulhárí. Burman (Flora Indica, p. 82), Roxburgh (Flora Indica, Vol. II., p. 143), Ainslie (Mat. Med. of Hind., p. 164), and others speak of it as violently poisonous, and it finds a place in the list of Indian poisons published by Chevers (Indian Ann. of Med. Sci., Vol. II., p. 147); but none of these authorities furnish any satisfactory details of a case in which its ill effects have been observed. Moidín Sheriff states that in doses of 12 grains it produces no poisonous effects, but acts as an alterative, tonic and antiperiodic. In Bombay it is popularly spoken of as a poison, and is said to be sometimes criminally administered to cattle. A small piece of the root is said to be a certain remedy for worms in cattle. The juice of the root is made into a paste with Boranti leaves and applied in scorpion stings.

Description.—This beautiful climbing plant, which adorns the hedges at the end of the rainy season, has a tuberous cylindrical or flattened root, often 7 to 8 inches long and about one inch in diameter; it consists of two tubers which unite at a right angle, one being much smaller than the other; at the point of union may be seen, on the upper surface, a circular scar marking the attachment of the stem, and on the under surface immediately beneath it another, to which a tuft of thin rootlets is often attached. The tubers are covered with a brown epidermis, except at the point, which is tapering and nearly white, like the growing part of a young kidney potato. Internally they are juicy, white, and farinaceous, and have a faint acrid odour. The taste is mucilaginous, feebly bitter, and a little acrid.

Microscopic structure.—The bulk of the root consists of starch granules, principally ovoid, contained in very delicate thin-walled cells. The vascular bundles are few, and consist of spiral and jointed vessels. The epidermis is an exuvium of the delicate cellular structure compressed and discoloured.

Chemical composition.—The root has been examined by Warden (1880), who obtained from it two resins, *a* and *b*, in a pure state, and a bitter principle, which he has named Superbine. He considers that the bitter principle is closely allied to if not identical with that of Scilla maritima.

Scilla hyacinthoides, *Linn.*, *Bot. Mag.*, *t.* 3226.

Syn.—Ledebouria hyacinthoides ; *Vern.*—Shiru-nari-vengayam (*Tam.*), Paháríkánda, Nání-janglí-kándo (*Bomb.*), yields a small bulb, which is said by Ainslie to be used by farriers in Southern India for the relief of strangury and in fevers occurring in horses. (Mat. Ind., Vol. I., p. 402.) From Dr. Hove we learn that the bulbs were used in the Colaba Hospital, Bombay, by Mr. Guise, the Surgeon of the island in 1787, instead of squills. For many years they were issued from the Bombay Medical Stores in lieu of squills (Indian Journ. of Med. Phys. Sci., Jan. 18th, 1838, p. 9), but of late years Urginea indica has been in use ; both appear to be equally satisfactory substitutes for squills.

L. hyacinthoides has a scaly bulb, about the size and shape of a small pear, composed of very smooth and fleshy scales, which are so imbricated that they might be mistaken for entire coats if not carefully examined, the exterior scales are dry and whitey-brown, the interior fleshy and cream-coloured ; the odour is nauseous ; the taste bitter and acrid. The bulbs are used in native practice. They are regarded as having properties similar to those of Urginea indica. Value, 1 to 2 annas per lb.

The bulbs purchased in the Bombay shops which I have cultivated proved to be those of Ledebouria maculata, *Dalz.* The leaves were obovate, glabrous, wedge-shaped, attenuated into the petiole, purple spotted, and never bearing bulbs ; scapes bearing a many-flowered raceme of small asphodel-like flowers having a delicate purplish-blue tinge, and a bloom like that of the Auricula.

Hermodactylus. Colchicum sp. ?

Vernacular.—Súrinján (*Hind., Bomb., Beng., Tam.* and *Arab.*)

History, Uses, &c.—The Hermodactyl, or " Finger of Hermes," was unknown to the early Greeks ; it appears to have been first used medicinally by the Arabs or later Greek physicians ; it was first mentioned by Alexander of Tralles, who flourished A.D. 560. (Lib. XI.) It is deserving of special notice that under the name of Surugen or Hermodactyl, Serapion comprehends the κολχικον and εφημερον of Dioscorides and the ερμοδακτυλος of Paulus Ægineta.* (Pereira, Vol. II., Pt. I., p. 166.) Masih and other early Arabian writers describe three kinds of Hermodactyl, the white, yellow and black ; in this they are followed by most of the more recent Mahometan writers. According to Ibn Sina the flower of the Surinjan is the first flower which appears in spring in the moist valleys beneath the mountains ; the leaves, he says, lie flat upon the ground, the flowers are yellow and white. Mír Muhammad Husain tells us in his Makhzan that the white is the best, and that it is not bitter ; next the yellow ; both may be used internally ; the black he says is poisonous and only to be used externally. He describes the Hermodactyl plant as having leaves like a leek and a yellow flower ; it is called in Persia Shambalíd ; the black variety he says has red flowers. Mahometan physicians consider the drug to be deobstruent, alterative and aperient, especially useful in gout, rheumatism, liver, and spleen. In gout they combine it with aloes: with ginger and pepper it is lauded as an aphrodisiac; a paste made of the bitter kind with saffron and eggs is applied to rheumatic and other swellings; the powdered root is sprinkled on wounds to promote cicatrization. Two kinds of Surinján are met with in Indian shops, *bitter* and *sweet.* European physicians in India who have tried the drug consider the sweet Hermodactyl to be inert or nearly so, and the bitter to have properties similar to Colchicum. (Confer. Phar. of India, p. 246.)

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* Conf. Dios. iv., 82, 83. Paulus Æg. iii., 78.

Description.—Súrinján-i-shírín, or tasteless Hermodactyl. Speaking of this drug as furnished to him from India by Dr. Royle, Pereira says:—"In their general form these corms resemble those of Colchicum autumnale. They are flattened, cordate, hollowed out or grooved on one side, convex on the other. At their lower part (forming the base of the heart) is a mark or disc for the insertion of the root fibres. Their size varies; the specimens I have examined were from ¾ to 1½ inch in length or height, 1 to 1½ inch in breadth, and about ½ an inch in depth. They have been deprived of their coats, are externally dirty yellow or brownish, internally white, easily broken, farinaceous, opaque, odourless, tasteless, or nearly so, and worm-eaten. They agree precisely with Hermodactyls furnished me by Professor Guibourt.

" Súrinján-i-talkh, or bitter Hermodactyl. The corms of this variety are distinguished from the preceding by their bitter taste, their smaller size, and by having externally a striped or reticulated appearance. Their colour for the most part is darker; in some specimens it is blackish. One corm is ovate cordate, one inch in height or length, ¾ of an inch broad, and about ¼ inch thick, grooved or hollowed on one side, convex on the other; of a brownish-yellow colour, semi-transparent, has a horny appearance, and is marked by longitudinal stripes, indicating a laminated structure. A second is opaque, amylaceous, reticulated externally, white internally, less flattened and of a remarkable shape, the concave or hollow side of the corm being continued half an inch below the mark for the attachment of the root fibres." (Mat. Med., Vol. II., Pt. I., p. 167.) Pereira's description agrees exactly with the Hermodactyls of Bombay.*

Microscopic structure.—The starch grains of the tasteless Hermodactyl are large and muller-shaped.

Chemical composition.—Lecanu has analysed the tasteless variety, and obtained the following result—Starch (forming the bulk of the drug), fatty matter, yellow colouring matter, gum, supermalates of lime and potash, and chloride of potassium. The bitter kind does not appear to have been examined.

Commerce.—Hermodactyls are imported into Bombay from the Red Sea ports and from Persia. Value, Re. ¼ per lb.

Substitute. The sliced bulb of the true Narcissus (N. tazetta) imported from Persia is sold in Bombay as bitter Súrinjan. It may be at once detected by its larger size and tunicated structure. The taste is bitter and acrid, the substance amylaceous and very similar to that of the Hermodactyl. It is used as an external application, and according to the author of the Makhzan has properties very similar to those of Súrinján-i-talkh. Value, annas 3 per lb. The several species of Narcissus (Gr. νάρκισσος) have a similar action. Pliny describes their emetic, purgative, maturative and drying powers, and referring to their soporific virtue, says, "et a narce narcissum dictum non a fabuloso puero." The Arabs give a similar account of them. Orfila's experiments upon dogs show that they act as local irritants, and also exert a depressant and paralysing effect upon the brain and whole nervous system. In man small doses are emetic; recently from 15 to 30 grains of the flowers of the common daffodil have been recommended as an emetic for children.

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* Prof. J. E. Planchon is of opinion that C. variegatum, *Linn.*, is one of the plants which furnish Hermodactyls. (Ann. des Sciences Nat. Bot., IV. (1855), 132.) Flückiger and Hanbury do not consider that the bitter kind is the produce of a colchicum; see also Cook in Pharm. Journ. April 1st, 1878.

Smilax China, *Linn.*, *Kæmp. Amæ.*, *t.* 782. The root.

Vernacular.—Chob-chíní (*Hind.*, *Beng.* and *Bomb.*), Páringay púttay (*Tam.*)

History, Uses, &c.—China root is described in native works on Materia Medica as a new medicine; it appears to have been introduced into India from China by the Portuguese before the middle of the 16th century. The Arabs call it Khashab-es-síní; in India it is universally known by its Persian name Chúb-chíní (China wood). The author of the Makhzan-el-Adwiya has a long article upon its medicinal virtues. He also notices particularly the variable appearance of different samples of the drug, and directs that what is heavy, of a rosy colour and free from knots to be selected. He tells us that the fresh root is sometimes brought to India; some of this he planted at Moorshedabad (A. H. 1178); it produced a climbing stem with small elongated leaves, not unlke a bamboo; after a year's time he dug it up, but found that the roots had degenerated and did not retain the qualities of the China article. Chob-chíní, though now little used in Europe, still retains its celebrity in the East, and is consumed in enormous quantities both in India and China, the natives considering it to be anti-rheumatic, anti-syphilitic, aphrodisiac, and demulcent. Roxburgh informs us that the Smilax glabra, a native of Sylhet and of the adjacent Garrow country, where it is called Hurina-shook-China, has large tuberous roots, not to be distinguished by the eye from China root, and that the natives of the country use a decoction of the fresh root for the cure of sores and venereal complaints.

Description.—The tubers of Chob-chíní, which are formed upon the fibrous roots of the plant, are of the shape and size of an elongated kidney potato, somewhat flattened, knotty, covered with a rusty coloured bark, sometimes smooth and shining, sometimes rough; internally their substance is of a pinkish-white colour, hard and farinaceous, insipid, mucilaginous and inodorous.

The drug is usually peeled and trimmed, and consequently is of irregular form, resembling a piece of heavy pinkish-white wood.

Microscopic structure.—The bark consists of thick-walled dark-brown brick-shaped cells, which contain bundles of crystalline needles and resinous matter. The bulk of the tuber is made up of a parenchyma, the cells of which are large, thin-walled, and loaded with starch, some pink colouring matter is also present. The starch grains are large and have a radiate hilum. The vascular system is scalariform, and is associated with porous wood cells.

Chemical composition.—No active principle has been separated.

Commerce.—The drug is brought to Bombay from Chinese ports and Singapore by the coasting steamers. Value, unpeeled, Rs. 3 to Rs. 4 per maund of 37½ lbs.; peeled, Rs. 9. Most of the China root of commerce is produced in the province of Onansi. In 1881-82, Bombay imported 945 cwts., valued at Rs. 12,692.

Smilax ovalifolia, *Roxb.*, *Rheede Hort. Mal. vii.*, *t.* 31, Janglí-ushbah (*Hind.*), Malaittámara (*Tam.*), Gútwel, Gútí (*Bomb.*), is a climbing shrub very common in the Concans. The roots are very numerous, and have a general resemblance to Sarsaparilla. A section shows a dry, suberous, brown bark; secondly, one row of 5-sided yellow cells, which are more or less wedge-shaped, their nuclei being situated towards the apices; thirdly, a range of numerous rows of ovoid cells, variable in size, with central nuclei; these extend as far as, and partially surround, the vascular zone, which consists of large vessels with generally two smaller ones in contact with them. Within the vascular zone the central portion of the root is made up of large thin-walled cells, filled with starch or red colouring matter; the latter is most abundant in young roots. Gútí is not used in Bombay, but in Goa it is kept in all the shops, and is the country sarsaparilla of the Portuguese.

Asparagus adscendens, *Roxb.* The tuberous root forms the Suffed-musli of commerce, which consists of shrivelled decorticated tubers, from 2 to 2½ inches long, the largest being about ¼ inch in diameter; they are of an ivory white colour, often twisted, hard and brittle; adhering to some of the pieces may be seen portions of a yellowish epidermis; when soaked in water they swell up and become spindle-shaped, the thickest part being about the size of a lead pencil. Under the microscope these tubers present a delicate cellular structure, the cells of which contain nothing but a little fine granular matter and mucilage; this surrounds a central vascular column, the middle part of which is entirely occupied by jointed vessels, the outer portions consisting of scalariform; the portions of adherent epidermis already mentioned are silicious. Suffed musli has an agreeable mucilaginous taste; it contains no starch. I have used it largely as an article of diet; it is far nicer than Salep, and is generally relished by Europeans. To prepare it, take 200 grs. of the powder, 200 grs. of sugar, pour upon them slowly a large tea-cupful of boiling milk, stirring constantly all the time. Bombay is supplied with Suffed-musli from Rutlam in Guzerat. Parcels differ much in quality. The best white picked is worth Rs. 25 per maund of 37½ lbs.

Asparagus sarmentosus, *Willd., Rheede Hort. Mal. x., t.* 10, is common in the Concans; it has a woody root-stock, to which are attached a number of ovate or elongated tubers. The local names are Zatar, Makki and Satawrí. Satawrí is used medicinally in the fresh state; it is simply mucilaginous. In the Concan the juice of the fresh root is given with an equal quantity of cocoanut juice to the extent of ¼ of a seer to promote the secretion of milk; it is also given with honey in 2 tolá doses for bilious dyspepsia.

Asparagus officinalis, *Linn., Eng. Bot.* 339; *Blackw., t.* 332. Under the name of Haliyún, the berries of the common Asparagus, imported from Persia, are sold in the shops. They contain Asparagin. The hakíms consider them to be diuretic, aphrodisiac and tonic, and prescribe them in dyspepsia and in liver, spleen and renal disorders. Asparagus communicates a strong disagreeable odour to the urine; the root is one of the five aperient roots. Broussais in 1829 discovered the sedative action upon the heart of Asparagus tops; a syrup is used in France, and Asparagin has lately been recommended in doses of from 1 to 2 grains as a diuretic, in cardiac dropsy and chronic gout.

Thum-el-barri, *Arab.* Muscat garlic of Bombay.

Muscat, or wild garlic, is a bulb resembling Badshah Salep in shape and appearance, but considerably smaller; it has a powerful garlic odour, and is much used for pickling by the natives. Large quantities are imported. It appears to have been sometimes confounded with Badshah Salep. In native practice Garlic oil obtained by expression from the bulbs of Allium sativum is administered to prevent the recurrence of intermittent fever, it is also applied externally in paralytic and rheumatic affections. Garlic is the σκόρδον of the Greeks, and is mentioned by Celsus, (2, 27 and 29,) as having stimulant and aperient properties. A syrup (Syr. Allii) was formerly officinal in the Dublin Pharmacopœia, and was given in doses of 2 drams in moist asthma, just as it is at the present day in India for the same affection. Two kinds of oil of Garlic are prepared : 1*st*, by expression of the sliced and dried bulbs; 2*nd*, by frying the sliced bulbs in sweet oil; the first kind is most esteemed.

HŒMODORACEÆ.

Sanseviera zeylanica, *Willd., Roxb. Cor. Pl.* 2, *t.* 184; *Bot. Reg., t.* 160. Bowstring Hemp. Marúl, Múrva (*Hind.*), Ghannasaphan (*Bomb.*), Marúl-kalung (*Tam.*) The juice of the root and leaves is used as an expectorant, and for snake-bite, especially that of the Ghannas snake, hence the Bombay name. This snake is the Daboia Russellii, one of the true vipers.

COMMELINACEÆ.

Tradescantia axillaris. *Willd., Rheede Hort Mal. x., t.* 13; *Roxb. Cor. Pl.* 2, *t.* 107. Rheede states that a decoction of this plant is considered as a useful remedy on the Malabar Coast in cases of tympanitis. The plant is common in the Western Deccan, but I have not known it to be used medicinally. In the last Deccan famine the seeds were largely used by the people as a food grain. For analysis, see appendix on Famine foods.

DIOSCORINEÆ.

Dioscorea sp. var. This genus is of much importance as a source of food in India, and some species of Dioscorea are used medicinally on account of their acrid or bitter properties. As a food D. sativa and D globosa (*Vern.*—Chaina or Kaunphal), the long and round yams (of which there are several varieties) are cultivated almost everywhere, and afford a wholesome vegetable. D. aculeata, the Goa potato (*Vern.*—Kanté-kángi) is less common, but deserves to be more generally known, as it the whitest and most delicate of the species, and is dry and mealy and quite free from the mucilaginous taste which makes the common yam cloying to the appetite; it is planted in June, just before the rains, and in November yields a cluster of tubers similar in shape and size to kidney potatoes. D.

bulbifera (*Vern.*—Karinda) in its wild state is extremely bitter; the small potato like tubers on the vine dried and powdered are used as a medicinal application to sores, and are given internally in 4 massa doses with a little cummin and sugar in milk as a remedy for syphilis and for dysentery ; the powder made into a bolus with butter is given to check diarrhœa ; the roasted tubers of the cultivated variety made into balls with ghi and sugar-candy have a reputation as a remedy for piles : under cultivation the plant loses its bitterness and is much grown in the Concan, where the tubers are roasted and eaten. D. triphylla (*Vern.*—Mánda) is very acrid, and is sometimes used to disperse swellings; it can be eaten when the acridity has been removed by cooking, but is even then considered to be unwholesome. D. pentaphylla (*Vern.*—Shendorwel) affords large edible tubers, and the male flowers are eaten as a vegetable. The young shoots of D. tomentosa (*Vern.*—Chenyel) are also eaten as greens. Yams consist principally of starch and mucilage, and contain more or less of an acrid volatile principle which does not appear to have been isolated.

TYPHACEÆ.

Typha angustifolia, *Linn., Eng. Bot.* 1456. *Vern.*—Rámabána. The soft woolly inflorescence of the male spadix is applied like cotton to wounds and ulcers. The plant is abundant on the banks of the Indus, where it is called "Pun." From the pollen is made the Búr or Búratú, much eaten by the natives of Sind. The Sanskrit name is Eraka.

Description.—Perennial, culms straight, 6 to 10 feet high, round, smooth, jointed at the insertion of the leaves; leaves long, ensiform, obtuse, flat on the inside, as long or nearly as long as the stem, about 3 to 4 inches broad; sheath smooth, embracing the culms; male catkin 2 to 3 inches above the female, cylindric, 8 to 10 inches long, densely covered with stamens, and numerous 3 to 4 cleft fine filaments, each with 2 to 3 anthers; anthers linear; female catkin 8 to 10 inches long; glume with fine filaments.

CYPERACEÆ.

Cyperus rotundus, *Linn., Rottb.* 28, *t.* 14, *f.* 2.

Vernacular.—Motha (*Hind.* and *Beng.*), Korai (*Tam.*), Barikmoth (*Bomb.*), Bimbal (*Mar.*)

History, Uses, &c.—The Mustaka of Sanskrit writers, a very common plant in most parts of India, considered to be diuretic, diaphoretic, astringent and stomachic, and prescribed in febrile affections and derangements of the bowels. Cattle are very fond of it. In the Concan the fresh tubers are applied to the breast in the form of a *lép* (malagma) as a galactagogue. C. rotundus is the κύπερος of the Greeks, and is mentioned by Dioscorides, who says it is the Juncus or Radix Junci of the Romans, and is used as a diuretic and emmenagogue, and applied to scorpion stings, and when dried to spreading ulcers; it is also an ingredient of warm plasters. Herodotus (4, 71,) notices it as an aromatic plant, used by the Scythians for embalming. κύπειρον is mentioned in the Iliad (21, 351,) and Odyssey (4, 603,) and by Theophrastus in his fourth book; it appears to have been a favourite food of horses. Pliny (21, 18,) calls it Juncus triangularis or angulosus; it is also probably the Juncus of Celsus (3, 21,) mentioned as an ingredient in a diuretic medicine for dropsy, although he calls it Juncus quadratus. C. rotundus is doubtless the سعد (Suad) of Abu Hanifeh, who describes it as a certain kind of sweet smelling root or rhizome (ارومة), round, black, hard like a knot, which is an ingredient in perfumes and medicines. In the Kámús it is said to possess a wonderful efficacy for healing ulcers and sores. Ibn Sina says that the best kind of Suad is that which comes from Kufa in Chaldea, and that the Indian drug (C. pertenuis) is said to make the hair grow thin. He along with other Arabian and Persian writers describes the drug as attenuant, diuretic, emmenagogue, lithontriptic and diaphoretic; they prescribe it in febrile and dyspeptic affections, and in one ounce doses as an anthelmintic; externally it is applied to ulcers, and used as an ingredient in warm plasters.

Description.—Culms erect, 1—2 feet, triangular, with rounded angles; leaves radical; sheathing, shorter than the culms; root tuberous, tubers often crowded together, size of filberts, brown or black externally, white internally, odour like that of Acorus; umbels terminal, compound; involucre 3-leaved, unequal; spikes linear, sub-sessile. Often a troublesome weed in cultivated ground.

Commerce.—C. rotundus is hardly ever met with as a commercial article in Bombay.

Cyperus pertenuis, *Roxb.*

Vernacular.—Nágarmoth (*Hind.* and *Bomb.*), Lawâla (*Mar.*)

History, Uses, &c.—This plant produces the aromatic tubers which have long been in use in Hindu medicine and perfumery under the Sanskrit name of Nágar-mustaka; they are considered to have the same medicinal properties as those of C. rotundus. Arabian and Persian writers mention this Indian Cyperus, but consider it to be inferior to C. rotundus. In the Concan Nágarmoth, Solanum indicum, Tinospora cordifolia, Ginger and Emblic myrobalans, of each 2 tolás, are powdered and divided into 5 parts, and one part taken daily in decoction with a little honey and long pepper as a febrifuge. Several other prescriptions of a similar nature are used in fever, and will be found in the Wanaushádi Prakasha. In dysentery, Nagarmoth, Mocharas, Lodhra, Daitiphul (Woodfordia floribunda flowers), unripe Bael fruit and the seeds of Holorrhena antidysenterica are ground with whey and molasses and given in 6 massa doses. In famine seasons Nágarmoth has proved a valuable resource to the poor.

Description.—The ovoid tubers of this plant are developed upon a thin under ground stem, and are simple or branched, generally about 2 inches long and ½ an inch in diameter; the external surface is marked by a number of annular ridges, and is almost concealed by the remains of leaves; when these are removed, the colour of the tuber is a deep brown; a few wiry rootlets arise from its under surface, and at the lower end is a portion of the underground stem. The substance of the tuber is hard and of a reddish colour; it is divided into a central and cortical portion, the latter being of a darker colour. The odour is strongly aromatic like Acorus, but somewhat terebinthinate. The plant is aquatic and grows in the Concan in ponds and ditches along with Scirpus subulatus, *Vahl.*, both plants are called Lawála in Marathi, a name which appears to be equivalent to the English *Rush.*

Microscopic structure.—The outermost layer of the cortical portion is composed of large bundles of reddish-brown stony cells, separated from one another by interspaces; within it are from 6 to 8 rows of very thick-walled, empty cells; next a tissue of thick-walled cells, most of them full of large starch granules, but some containing essential oil and probably resinous matter. The central portion of the tuber is separated from the cortical by a single row of small yellow stone cells; it is composed of thick-walled cells full of starch like those in the cortical portion, but differs from it, inasmuch as many of the cells contain red colouring matter. Large vascular bundles abound in the root, some of them are surrounded by a layer of stony cells.

Commerce.—Two kinds of Nágarmoth are met with in this market—Surat and Kattiawar, the first is heavier and more aromatic than the second. Value, Surat, Rs. 2 per maund of 37½ lbs.; Kattiawar, Rs. 1¼. The Surat Nágarmoth is probably obtained from Rájputana, where the plant is common in tanks.

Scirpus Kysoor, *Roxb.* *Vern.*—Kasírú (*Hind.*), Kachara (*Bomb.*) The tuberous root found in tanks, about the size of a nutmeg, and of a black colour externally, has astringent properties, and is given in diarrhœa and vomiting.

GRAMINEÆ.

Andropogon Schœnanthus, *Linn.*, *Trin. Sp. Gr. iii.*, *t.* 327. The essential oil.

Vernacular.—Rusa. The oil, Rúsa-ka-tel, Roshel.

History, Uses, &c.—Rúsa oil, was first brought to notice in 1825 by Maxwell (Calcutta Med. Phys. Trans, Vol. I., p. 367); it was further described in 1827 by Forsyth. (*Ibid.*, Vol. III., p. 213.) It is only in comparatively recent times that the volatile oil has become an article of commerce ; it is now chiefly distilled in the Nimar district, an iron still being used and a very small quantity of water; when the still is carelessly worked, the grass burns and communicates a dark colour to the oil, which should be of a pale sherry colour. I am assured by the Bombay dealers that all the oil of commerce is more or less adulterated ; a comparison of the commercial article with some oil distilled by myself supports this statement ; the adulteration is said to be practised by the distillers, who, I am informed, are regularly supplied with oil of turpentine from Bombay. The grass flowers in October and November, and is then fit for cutting. 373 lbs. of grass received from Khandesh and submitted to distillation under my own superintendence in Bombay yielded 1 lb. 5½ ozs. of oil. Portions of this oil were mixed with oils of turpentine, groundnut, rape, and linseed; with all three it formed a milky or turbid mixture, but the two first, after standing for some days, became perfectly bright. I am informed that formerly it was the custom to adulterate with groundnut oil, but that turpentine is now used, as it cannot be detected by the evaporation test. The genuine oil is dextrogyre, the ray is rotated 39° to the right by 100 mm., 200 mm. rotate it 78°. Some samples of the commercial article rotate the ray about 13° to the right, some have little or no effect upon it.

Description.—Root perennial, with long wiry fibres; culms erect, from 3 to 6 feet high, often ramous, smooth, filled with a spongy pith; leaves very long, tapering to a very fine point, smooth in every part, and of a soft delicate texture; sheaths, shorter than the joints on full-grown plants, with a membranaceous stipulary process at the mouth; panicles linear, subsecund; spikelets paired, but with only three joints; flowers also paired, one-awned, hermaphrodite and sessile, the other, awnless, male and pedicelled, the terminal florets are three, one hermaphrodite, sessile and awned, the other two male, pedicelled, and awnless.

Hermaphrodite calyx one-flowered, two-valved, base girt with wool, as is also the rachis and proper pedicels; corol one-valved, a long black awn occupies the place of the other, which has two small filaments at its base; nectary two minute leaflets embracing the germ laterally; stamens, pistil and seed as in the genus.

Male calyx as in the hermaphrodite; corol one valved; nectary and stamens as in the hermaphrodite, no pistil. (Roxb. A. Martini.) The oil is of a pale sherry colour, has an agreeable odour slightly like that of otto of roses, and quite distinct from that of lemon grass. (A. citratus, D. C.) Its taste is sharp and agreeable, approaching that of oil of lemons.

Chemical composition.—In 1844 Stenhouse examined a sample of oil of Nimar given him by Christison; it was of a deep yellow colour, and apparently old, lighter than water, and quite neutral to test paper. When mixed with water and subjected to distillation, it left nearly one-half of its bulk of a fluid resin. The oil which passed into the receiver was colourless, but its smell was not quite so agreeable as before distillation, and the same was the case with the resin in the retort. The oil was rendered anhydrous by treating it with chloride of calcium and again rectifying it. It began to boil at 297° F., but the boiling point gradually rose to 320°, when it became stationary for some time, and then continued rising. When subjected to analysis, 0·3465 gr. gave 1·061 of carbonic acid and 0·3575 water.

Carbon	83·76
Hydrogen	11·46
Oxygen	4·78
	100·00

As the analysis evidently showed that the oil consisted of a carburetted hydrogen mixed with a little of an oxygenated oil, a quantity of the rectified oil was treated with small pieces of sodium. These immediately caused an evolution of hydrogen, but this ceased in a short time, and the bits of sodium which had not dissolved remained quite bright, while a small quantity of a reddish coloured resin was also formed. The oil was then poured off the sodium and rectified. When subjected to analysis, 0·2675 gram. gave 0·855 of carbonic acid and 0·277 water.

Carbon	88·37	at 5 Carbon	= 88·46
Hydrogen	11·50	4 Hydrogen	= 11·54
	99·87		100·00

The grass oil consists, therefore, of a carburetted hydrogen having the same composition, $C^5 H^4$, as the numerous other oils, of which oil of turpentine is the type, together with a small quantity of one or more oxygenated oils. The affinity which this grass oil has for oxygen appears to be very considerable; for even after being purified, the carburetted hydrogen part of the oil cannot be distilled without a little of it being converted into a resin. The resinous matter, of which the oil contains such a large quantity, is, I should think, therefore, most probably the effect of oxidation. (Proceedings of the Chemical Society, 1844.)

Khandesh oil examined by Flückiger yielded nothing crystalline when saturated with dry hydrochloric acid; but when afterwards treated with fuming nitric acid, crystals of the compound, C^{10} H^{16} H.Cl. sublimed into the upper part of the vessel. (Pharmacographia, p. 661.)

Commerce.—The annual exports of Rúsa oil from Bombay to the Red Sea ports and Europe exceed 40,000 lbs. It is much used by the Arabs and Turks as a hair oil. The Bombay dealers know nothing of its being used to adulterate otto of roses. In India sandalwood oil is used for that purpose. Value, Re. 1½ to Rs. 3½ per lb., according to quality. It is sold in pots which contain about 40 lbs.

Andropogon laniger, *Desf., Trin. Ic. Gr., t.* 326. The plant.

Vernacular.—Izkhír (*Arab.* and *Bomb.*), Khávi (*Punj.*)

History, Uses, &c.—This plant has a wide distribution, extending from North Africa, through Arabia, and Northern India to Thibet; it is the σχοῖνος ἀρωματικὸς of Dioscorides and the Herba Schœnanthi and Juncus odoratus of Latin writers on Materia Medica. It has also been named Fœnum camelorum, from its use as a forage for camels. The Arabic name Izkhír is given in the best Lexicons as derived from the root ذخر; the same root furnishes the derivative Zakhírah, a common term in India for stored-up forage, &c. Abú-Haníjeh Ed-Dínawarí, author of the "Book of Plants," has the following description of the plant:—"It has a root hidden in the ground, slender, pungent in odour, and is like the straight stalks of the كولان (Kaulán or papyrus plant), save that it is wider, and smaller in the كعوب (ku'oub, internodal spaces), and it has a fruit resembling the brooms of reeds, but more slender, and smaller; it is ground, and is an ingredient in perfumes; it grows in rugged and in smooth grounds; but seldom does more than one grow in the same spot; when it dries it becomes white. (Madd-el-Kámús.) Though no longer used in Europe, this grass is still to be met with in all Eastern drug stores. Western India is supplied from the Persian Gulf ports, but the authors of the Pharmacographia state that they have received specimens under the name of Kháví, gathered by Mr. Tolbort between Multán and Kot Sultán, which quite agree with the drug of Pharmacy. The author of the Makhzan-el-Adwiya describes two kinds of Izkhír, and gives the following synonyms:—"Arabic, Tibn-Makah, Khillál-mamúni and Tíb-el-gharíb; Turkish, Sakhis or Sakhís; Hindí, Gundhís, Gundbel, Guntúl, Sondhí, Rús and Súriya; Persian, Gor-giyah, Kah-i-Makah, Kazneh-i-dashtí, Gurbah-i-dashtí. He says that the powdered grass is called Ghusúl by the inhabitants of Mecca, who use it as a perfume for the bath. His second kind, Izkhír-i-jámí, or Bikh-i-wála, is the Khaskhas of India. From the Indian names abovementioned, he appears to have confounded the true Herba Schœnanthi with the Andropogon Schœnanthus of Linnæus; possibly the latter plant is sold in some parts of the country as Izkhír. (Confer. Guibourt, 6^{me} Ed. II., 100.) In Mahometan medicine Izkhír is prescribed as a diuretic, emmenagogue, and deobstruent, also as a stimulant to promote perspiration and expectoration."

Description.—This grass is distinguished by its simple rhizome, short thick tuft of radical leaves, and lanigerous calyx. The odour is like that of oil of Rhodium; the taste aromatic, bitter, and somewhat acrid.

No chemical examination appears to have been made.

Andropogon muricatus, *Retz., Beauv. Agr., t.* 22. The root.

Vernacular.—Khas (*Hind.*), Bena (*Beng.*), Wála, Wárélu (*Bomb.*), Vetti-ver (*Tam.*)

History, Uses, &c.—This grass grows in many parts of India, in Bengal, in Oudh, in the south of the peninsula and in Burmah; it is cultivated for its roots, which are used in making the fragrant fans and screens known as "Khaskhas tatties." The plant requires a rich moist soil. It covers large tracts of waste land in the province of Cuttack. The roots are used as a cooling medicine, and are taken mixed with other medicines having a similar reputation, *viz.*, Cyperus, Pavonia odorata, Oldenlandia herbacea, &c. A weak infusion may be given as a cooling drink in fever. A paste made by grinding the roots with water is used externally as a cooling application in fever. The Sanskrit names are Ushira and Virana, the Persian Izkhír-i-jámí and Bíkh-i-wála. In Europe Khaskhas is used as a perfume, but only within comparatively recent times.

Description.—A. muricatus has an erect compressed culm, 5 to 6 feet high, with smooth nodes and linear-narrow sub-bifarious rigid elongated leaves; the panicle is verticelled; the branches are very numerous, simple and spreading; the joints of the rachis are smooth; the glumes are minutely prickly on both sides, sub-equal, muricated. The radicles are very numerous and spring from a rhizome, on the upper surface of which are leaf-buds. The entire root is of a yellowish brown colour, and has a strong and persistent odour, somewhat like myrrh; the taste is bitter and aromatic.

Chemical composition.—Khaskas has been analysed by Vauquelin, who has obtained from it—1*st,* a resinous substance of a deep red-brown colour, having an acrid taste and an odour like myrrh; 2*nd,* a colouring matter soluble in water; 3*rd,* a free acid; 4*th,* a salt of lime; 5*th,* a considerable quantity of oxide of iron; 6*th,* a large quantity of woody matter. (Vauquelin Annales de Chimie, t. LXXII., p. 302.)

Andropogon citratus, *D. C., Wall., Pl. As. Rar.* 3, *t.* 280. Lemon Grass. Bhustrína (*Sans.*), Gandha bená (*Beng.*), Olencha (*Bomb.*), a well known grass common in Indian gardens and cultivated in Ceylon and Singapore for the sake of its essential oil, which is known in commerce as *Lemon Grass oil, Oil of Verbena, or Indian Melissa oil.* An infusion of the fresh herb is a favourite domestic remedy in India for catarrh, and acts as a stimulant diaphoretic.

Andropogon Nardus, *Linn., Bentl. and Trim., t.* 297; *Vernacular*—Usadhana, is a coarse, straggling grass which grows about old wells in the neighbourhood of Bombay; when crushed it has an odour like fresh ginger; it is used as a carminative in the bowel complaints of children. It is a native of Ceylon and Travancore, and is cultivated under the name of Citronella grass in Ceylon for the sake of the essential oil.

Kyllingia monocephala, *Linn., Rheede. Hort. Mal. xii., t.* 53; *Rottb. Gr., t.* 4, *f.* 4.

This is the Nirvishí of Sanskrit medical writers, who prescribe it as an antidote to certain poisons. The roots are aromatic and creeping; the culm erect and triangular, leafy at the base; the leaves membranaceous, flat towards the apex, ciliated with minute bristles on the margin and keel; the heads solitary, globose and dense; the involucre 3 to 4-leaved, very long, with single-flowered spikes.

Coix lachryma, *Linn., Rheede Hort. Mal. xii., t.* 70; *Bot. Mag., t.* 2479. Kassai-bíj (*Bomb.*), Rán-makkai (*Mar.*) The siliceous involucre of this grass containing the seed is sold in the drug shops. It is about the size and has much the appearance of a small cowrie shell, shining white, and very hard. At the base is a scar marking the attachment of the peduncle; at the apex an opening, from which, even in the dry state, a portion of the female flower may be seen protruding. In the fresh state a spike of male flowers, from one to two inches long, rises from it. Kassai-bíj is used as a diuretic. The following notice of it occurs in the Descriptive Catalogue of the Vienna Exhibition, 1873:—"The seeds of Coix lachryma, known as Job's tears, are used as food in China and Malacca, under the name of Eejin or Ee-yin. 'It is,' we are told, 'the most remarkable among food-grains for its chemical composition.' Dr.

Smith writes that 'it is larger and coarser than pearl barley, but it is equally good for making gruel. As it is sold for five pence per Chinese pound, it makes an excellent diet-drink for hospital patients in China.' Dr. Hooker observes that 'a great deal of Coix is cultivated in the Khasia hills; the shell of the cultivated sort is soft and the kernel is sweet, whereas the wild Coix is so hard that it cannot be broken by the teeth; each plant branches two or three times from the base, and from seven to nine plants grow in each square yard of soil; the produce is small, not above 30 or 40 fold.' In Mason's 'Burmah' it is stated that a species of Coix, with large esculent seeds, which are parched like Indian corn, are often for sale in the bazars, and are cultivated very extensively by the Red Karens."

Poa cynosurioides, *Linn.*, *Retz. Obs. iv.*, 20. *Vern.*—Darbh (*Bomb.*) This grass has a creeping root, which forms at intervals a number of small, very hard knots or bulbs, from each of which rises a stem, and from the under-surface of which numerous strong rootlets are given off. The culm is stout and round, clothed at the base with withered sheaths; in the drug it is cut off a few inches from the root. This article has a bitter taste; it is the Gramina of the Portuguese at Goa, and is used as a diuretic.* I have not seen it used medicinally in Bombay; but under the names of Kash, Darbh, or Dád, it is in constant requisition at the funeral ceremonies of the Hindus, the chief mourner wears a ring of the grass upon his finger; it is also placed beneath the pindás. Darbh must not be confounded with Dúrba (Cynodon dactylon), another grass which is sacred to Ganesh, and the juice of which is used as an astringent in epistaxis, and to stop bleeding from superficial wounds. In the Concan both of these grasses are prescribed in compound decoctions with more active drugs for the cure of dysentery, menorrhagia, &c.

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* The Gramen of the Romans and ἄγρωστις of the Greeks was Triticum repens, still much used as a diuretic in Europe.

Zea Mays, *Linn., Lam. Ill., t.* 749. *Bentl. and Trim., t.* 296.

Vernacular.—Makkai, Bhuta (*Hind.*), Janar (*Beng.*), Makkai (*Bomb.*), Makka-Sholam (*Tam.*)

History, Uses, &c.—The vernacular names of this cereal point to its introduction into India from Mecca, but the Durah-i-Makka or Gandum-i-Makka of Mahometan writers on Materia Medica, which they also call Khanderús (χόνδρος), is the Sorghum vulgare or Great millet, the Juar of Northern India, and the Sholam of Madras. The Arabs call Zea Mays Durah kízán or Durah Shámí. It seems probable that Maize is a native of Asia as well as America, since we learn from Chinese literature that it was cultivated in China in the 16th century, and was then traditionally asserted to have been an introduction from the west. It is now cultivated in all warm countries, and is considered by Mahometan physicians to have properties similar to those of Sorghum vulgare, *viz.*, resolvent, astringent and very nourishing; they consider it to be a suitable diet in consumption and a relaxed condition of the bowels. In Europe it is much used as a valuable article of diet for invalids and children under the names of *Polenta* (Maize meal) and *Maizena* (Maize flour). In Greece the silky stigmata are used in decoction in diseases of the bladder, and have lately attracted attention in America under the name of *Corn silk*, of which a liquid extract is sold in the shops as a remedy in irritable conditions of the bladder with turbid and irritating urine; it has a marked diuretic action. The meal has been long in use in America as a poultice, and gruel is also made of it. In the Concan an alkaline solution is prepared from the burnt cobs and is given in lithiasis.

Chemical composition.—The average results of the analysis of three varieties of maize in an undried state by Polson, yielded in 100 parts, 54·37 starch, 8·83 nitrogenous substance, 4·50 fat, 2·70 gum and sugar, 15·77 cellulose, 12·16 water, and 1·67 ash. Poggiale found on an average in 160 parts of the dried grain, 64·5 starch, 6·7 fat, and 9·9 nitrogenous substance.

Manisurus granularis, *Swartz., Roxb. Cor. Pl.* 2, *t.* 118.

Vern.—Trinpali (*Hind.*)

A grass common to India, Africa and the West Indies, mentioned by Ainslie (Mat. Ind. II., 434,) as having been brought to Dr. F. Hamilton in Behar, where it was considered medicinal, and prescribed internally in conjunction with a little sweet oil, in cases of enlarged spleen and liver. Ainslie gives Palanggini as its Sanskrit name.

Description.—Height 1 to 2 feet; culm very resinous, suberect, hairy; spikes terminal and axillary, several together, one inch in length; leaves numerous, very hairy, stiff, sharp; rachis jointed, much waved; flowers male and hermaphrodite, 4 to 10 of each sort. (Drury.) Common on barren ground.

Bambusa arundinacea, *Retz., Rheede Hort. Mal. i., t.* 16; *Roxb. Cor. Pl.* 1, *t.* 79. The siliceous concretion.

Vernacular.—Báns-lochan, Báns-kapur (*Hind., Bomb.* and *Beng.*), Munga-luppu (*Tam.*)

History, Uses, &c.—The following interesting remarks are by Sir G. Birdwood (confer. "Bombay Products," p. 95):—"Tabasheer is yielded by several species, but I am unable to specify any other than the above plant. Dalzell gives, besides this plant, three other species as common to Bombay, *viz.*, B. stricta (*Roxb.*), the 'Bás' or Oodha of the natives, of which Boar-spears are made; B. vulgaris (*Schreb.*), the 'Kulluck' or 'Bamboo'; and B. arundo (*Klein*), the 'Chiwaree' of the Ghauts, familiar to Europeans in the shape of 'Mahableshwar walking-sticks.' Tabasheer in an article of the greatest antiquarian interest, as Salmasius, Sprengel, and Fée are of opinion that it is referred to and not sugar, by the ancients, Dioscorides and Pliny for example, where they mention σακχαρον and Saccharum. Salmasius states that the saccharum of the ancients, as described by them, had none of the properties of sugar, and was used in ways sugar never could be; and in another place that the σακχαρον of the Greeks was tabasheer beyond all controversy." Against this dictum the line in Lucan has been cited—

'Quique bibunt tenera dulces ab arundine succos,'

as if the bamboo could be a "tenera arundo." But Salmasius quotes this very line, and yet goes on to show by arguments one finds it difficult to refute, although common sense would reject the conclusion, that cane sugar was unknown to the ancients. One would think Pliny's description left little room for doubt; yet Salmasius, by means of a comma, alters its whole meaning. The passage is as follows:—"Saccharon et Arabia fert, sed laudatius India; est autem mel in arundinibus collectum, gummium modo candidum, dentibus fragile, amplissimum nucis avellanæ magnitudine, ad medicinæ tantum usum." But, says Salmasius, "ita hæc distinguenda, collectum gummium modo, non ut est vulgo gummium modo candidum. Hæc omnia prorsum quadrant in tabascir, vel saccharum mambu;" it is white, brittle to the teeth, is collected in reeds, is sweet (!) and useful in medicine. Dioscorides says what is called *σακχαρον* is a kind of concrete honey, found in reeds in India and Arabia Felix, in consistence like salt, and brittle between the teeth like salt. Taken dissolved in water it is borne by the stomach, &c., &c. It is difficult to deny that sugar is not here meant, and very hard to consent that Tabasheer is. Pliny, copying from Disocorides, as is plain, confused Tabasheer with sugar in his description, and thus has involved the subject in a way well suited for the exercise of subtle and learned criticism. The honourable President of the Bombay Branch of the Royal Asiatic Society has suggested to the compiler a reading of Pliny as ingenious as that of Salmasius, and probably more just, inasmuch as it supports the common-sense view in the "Sugar Controversy." Placing a full stop where the first semicolon occurs, the Honourable Mr. Frere reads the passage as follows:—"Saccharon et Arabia fert, sed laudatius India. Est autem mel in arundinibus collectum," &c. As if Pliny, on mentioning, at once dismissed so familiar an article as "Saccharon," and then went on to describe in detail so rare a substance as Tabasheer must have been. Fée, Sprengel, and Humboldt simply follow Salmasius. Humboldt very diffidently. A passage from his Prolegomena de distributione Geographica Plantarum," (quoted in his "Cosmos,") states an opinion, all, on reading the whole controversy on sugar, will probably acquiesce in, and is on other accounts worth introducing here: "Confudisse videntur veteres saccharum verum cum Tebaschiro Bambusæ, tum quia utraque in arundinibus inveniuntur, tum etiam quia vox sanscradana scharkara, quæ hodie (ut Pers. Schakar et Hind. Schukur) pro saccharo nostro adhibetur, observante Boppio, ex auctoritate Amarasinhæ, proprie nil dulce (madu) significat, sed quicquid lapidosum et arenaceum est, ac vel calculum vesicæ. Verisimile igitur vocem scharkara duntaxat tebaschirum (succur nombu) indicasse, posterius in saccharum nostrum humilioris arundinis (ikschu, kandeschu, kanda) ex similitudine aspectus translatum esse. Vox Bambusæ ex mambu derivatur; ex kanda nostratium voces candis zuckerkand. In tebaschiro agnoscitur Persarum schir, h. e. lac, Sanscr. Kschiram." The Sanskrit name for tabascher is tvakkschîrâ, bark milk. Herodotus, Book XIV., ch. 194, writing of the Gyzantians, observes that in their country, "a vast deal of honey is made by bees; very much more, however, by the skill of men." In a note, Rawlinson states, "bees still abound in the country, and honey is an important article of commerce. A substitute for honey is likewise prepared from the juice of the palm." Sprengel states that the sugar-cane is first mentioned by Abulfaidil, 13th century, and sugar by Moses Chorenensis, A.D. 462; and notwithstanding that it must, the writer would apprehend, be metioned in Hindu books of a far earlier date, it is not a little remarkable that a Hindee name of sugar is "Cheenee."

Tabashir is called in Sanskrit Vansa-lochana; it is largely used as a medicine by both Hindus and Mahometans, and is considered to be cooling, tonic, aphrodisiac and pectoral. It is an ingredient in many compound medicines which are given in different kinds of lung disease. Sanskrit writers describe it as *sweet, i.e.*, not bitter. Pliny probably followed them in using the word 'sweet' in this sense. A decoction of the joints of the bamboo is supposed to have an action on the uterus, and is used by females after delivery to cause a free flow of the lochial discharge. The same part of the plant pounded with water is applied to inflamed joints. The juice of the leaves with aromatics is given in hæmatemesis.

Description.—Tabashir consists of irregularly-shaped fragments of an opaque white or bluish opalescent colour, the larger pieces are about an inch in diameter, concavo-convex, and have evidently derived their form from the joint of the bamboo in which the deposit has collected. The raw article is blackened and dirty, having apparently been obtained by burning the bamboos ; to make it fit for use it is calcined, when it becomes perfectly clean.

Chemical composition.—Tabashir is said to be composed of 70°/o silica and 30°/o potash ; it forms a glass on being fused with alkalies. The ash of Bamboo stems has been analysed by Hammerbacher with the following results: Si. O^2, 28·264 ; Ca.O, 4·481 ; Mg. O, 6·569; K^{2}O, 34·217 ; Na.^{2}O, 12·765; Cl, 2·062; SO^3. 10·705 ; Ferric phosphate, 0·037=99·100. The ash is rich in silica and alkalis, poor in alkaline earths. The proportion of alkalis is about the same as in the ashes of ordinary roots. (Liebig's Annalen, clxxvi., 87).

Commerce.—Bombay is chiefly supplied from Singapore with the raw article ; it is calcined in the town. Value, Raw, 3½ annas ; Calcined, 8 annas per lb.

Sult (*Arabic*), Jau-i-barahneh (*Persian*), Ati-jau (*Hindi.*) A bitter grass, something like barley, considered to be fattening and alterative. According to Golius it is the *gymnocrithon* (*i.e.*, Hordeum nudum) of Galen and *tragus* of Dioscorides.

Shalim (*Arabic*), Kákulak, Mushkak (*Persian*), Darnel grass (?) said to have intoxicating properties. Abú Hanifeh says that it is a small, oblong, red, erect grain, resembling in form the سوس (or grub) of wheat; and it does not intoxicate, but renders the wheat very bitter; and in one place he says the plant spreads on the ground, and its leaves are like those of the willow. Forskahl says, "Shalim etiam agri vitium; a priore (ziwan) tamen diversa species; decocto plantæ obtunduntur sensus hominis qui operationem chirurgicam subire debet; Avicenna sic referente." (Fl. Ægypt Arab., p. 199.) The Greeks called Darnel ἄιρα.

Rohish (*Hindi*), Kattrina (*Sanskrit*). The name of a fragrant grass very frequently met with in Hindu prescriptions. In Bombay it is generally considered to be Andropogon Schœnanthus, *Linn.*, Rúsa grass, but a similarity of the two names appears to be the only reason for this belief.

FILICES.

Polypodium vulgare, *Linn.*, *Eng. Bot.* 1149. Local name Basfáij (*Pers.*) The dried rhizome occurs in pieces of various lengths, and of the thickness of a quill. It is flattened, of a yellowish-brown colour externally, green internally, but when old yellowish; the upper surface is studded with tubercles, to some of which a portion of the base of the frond still adheres. The under surface is more or less spinous from the remains of broken radicles. The taste is sweetish, astringent, nauseous, and somewhat acrid; odour ferny. Under the microscope the rhizome is seen to consist of a delicate cellular structure containing much starch and green granular matter; it is traversed by large bundles of scalariform vessels. Analysed by Dêsfosses, it was found to contain a complex substance, partly resinous and partly oily, a fermentable sugar, a substance analogous to sarcocolla, an astringent matter, gum, starch, albumen, and salts of lime and magnesia. (Confer. Guibourt Hist. Nat., tom. II., p. 71.) Basfáij is aperient and deobstruent, and is considered to act as an expellant of peccant humours; it is also used as an alterative in a variety of disorders; it is frequently combined with cassia pulp and honey. The Mahometan hakíms use it largely. It is the Polupodion of the Greeks,* and the Azrás-el-kalb of the Arabs; the latter name, which may be translated 'Dogs' tooth' (fern), is given to it on account of the toothed appearance of the fronds.

Asplenium sp. *Vern.*—Kálí-pándan (*Goa.*) The part used medicinally is the rhizome, to which are attached the bases of the fronds and numerous radicles, all of a black colour. The rhizome is about as thick as the finger; when broken across it is seen to consist of a parenchyma in which are several bundles of vessels of a lighter colour. These can be separated from the canals in which they are situated without much trouble when the rhizome is fresh. Under the microscope the cell walls of the parenchyma appear of a dark brown colour, and the vascular bundles are seen to consist of large scalariform vessels. When at Goa I found this drug in all the shops, and was informed that it is considered a valuable alterative in cases of prolonged malarious fever; it has an astringent and slightly bitter taste. It does not appear to be known as a medicine in Bombay.

Adiantum venustum, *Don.*
„ **lunulatum,** *Burm., Hk. Ic. Pl., t.* 191.

The fronds are sold in Indian bazars under the names of Hansráj and Mobarkha; they appear to have been accepted by the Mahometans of India as a substitute for the ἀδίαντον of the Greeks,* which is the Maiden-hair fern of Europe, and is also found in Cabul and Persia. The native physicians consider Maiden-hair to be deobstruent and resolvent, useful for clearing the primæ viæ of bile, adust bile, and phlegm, also pectoral, expectorant, diuretic and emmenagogue. Used as a plaster it is considered to be discutient, and is applied to chronic tumours of various kinds. The Persian name is Parsiawashán. In Arabic it has many names, the best known are Shir-el-jinn and Shir-el-jibal (fairies'-hair and mountain-hair). Ibn Sina calls it Barsawashán. In France a syrup of Maiden-hair is much used as a pectoral; it ought to be prepared from the Adiantum pedatum, *Linn.*, the Capillaire du Canada of the French, but A. trapeziforme, *Linn.*, is now much used; it is known as Capillaire du Mexique.

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* Compare with Dioscorides iv., 180. *περὶ πολυποδίου.*

Description.—A. lunulatum : Stipes in tufts, polished black; fronds 6 to 18 inches long, longer than the petioles, recurved, alternately pinnate ; leaflets petioled, somewhat crescent-shaped, smooth.

A. venustum : Stipes highly polished, deep brown ; frond, 12 to 18 inches high, super-decompound ; its ultimate divisions round, wedge-shaped ; interior margin minutely dentate. Fructifications from one to three, though generally solitary on the anterior edge. (*Roxb.*)

Commerce.—A. lunulatum is collected in the hilly country separating the coast from the Deccan. A venustum is imported and is usually found in the shops. Value, 3 annas per lb.

Actinopteris dichotoma, *Bedd.* *Vern.*—Mápursika. A fern which grows upon rocks and old walls in the Deccan ; it is used as a styptic. " Actinopteris is a genus of polypodiaceous fern of the section Asplenicæ, and consists of curious

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* Compare with Dioscorides iv., 131. Adams considers A. capillus Veneris, *L.*, to be his ἀδίαντον.

little plants like miniature fan palms. The technical peculiarities of the genus among the Asplenicæ consist in the simple distinct indusia, free veins, and linear elongate sori, which are marginal on the contracted rachiform segments of the small flabelliform fronds." (T. Moore in "Treasury of Botany.") Atkinson states that this fern is used as an anthelmintic.

Polypodium quercifolium, *Spr., Rheede, Hort. Mal. xii., t.* 11; *Moris. Hist.* 3, *S.* 14, *t.* 1, *f.* 15.

Vernacular.—Básingh, Báshíng or Wándar-báshing (*Mar.*)

History, Uses, &c.—The plant derives its name from an ornament called *Básingh,* which the Marathi people tie upon the forehead of the bride and bridegroom at marriage ceremonies, and which resembles its fronds in shape. The rhizome of this fern is found closely adhering to the dead branches of trees which it invelopes with its leaves, these are large and broad, with deeply serrated margins and very stout prominent nerves. For medicinal purposes those plants which grow upon the Strychnos nux-vomica are preferred. The author of the Wanaushadi Prakásha gives the following prescription containing Básíngh as the best cure for phthisis :—Take 2 tolás of Kájra-básingh, 1 tolá Ooksi flowers (Calycopteris floribunda), 2 tolás Chiretta, 2 tolás Ghás-pitpapra (Rostellularia procumbens), 2 tolás Ringan-múl (root of Solanum indicum), 2 tolás Bál-belphal (small immature fruit of Ægle Marmelos), 2 tolás Padmini-múl (root of Nelumbium speciosum), 4 tolás Sonar-wel-múl, two tolás Gokhru-múl (root of Tribulus terrestris). These nine drugs are to be powdered and divided into seven parts. For administration each part is to be boiled in 40 tolás of water, sweetened with 2 tolás of sugarcandy, and the decoction (kára) boiled down to one-eighth; this is to be taken in the morning, and the marc is to be again treated in the same manner to furnish the nikára (second decoction) or evening dose. The same prescription is recommended in hectic fever from whatever cause, and in dyspepsia and cough; during its use potatoes and indigestible vegetables are to be avoided.

LICHENES.

Parmelia kamtschadalis, *Esch.*

Vernacular.—Ushnah (*Arab.*), Dowálah (*Pers.*), Charelah (*Hind.*)

History, Uses, &c.—The author of the Makhzan-el-Adwiya tells us that Ushnah grows upon the oak, cypress and other trees, that which is whitest should be preferred; it should have an agreeable odour. He describes it as astringent, resolvent, and aperient, and says that the decoction is used as a tonic and alterative; when burnt the smoke relieves headache, the powder is a good cephalic snuff. Externally the drug has emollient and astringent properties, and may be used in a bath or as a poultice, &c. The dry powder is applied to wounds and sores to promote granulation. Honigberger mentions the use of the drug at Lahore in disorders of the stomach, dyspepsia, vomiting, pain in the liver or womb, induration of the uterus, amenorrhœa, calculi, and nocturnal spermatic discharges. Ushnah appears to be kept by Mahometan druggists all over India, and to be a drug in general use; it appears to have much the same properties as Lichen Islandicus. In appearance it resembles the greyish-white Lichens so common on the dead branches of trees in Europe.

Parmelia perlata, *Ach., Eng. Bot.* 341.
,, **perforata,** *Ach., Eng. Bot.* 2423.

Vernacular.—Pathar-ka-phúl (*Hind.*), Mota dágada phúl and Barik dágada phúl (*Bomb.*), Kulpasi (*Tam.*)

History, Uses, &c.—Ainslie mentions this article, and gives Hinna-i-koreish as the Arabic name. He describes it as a dried, pale-coloured rock-moss, which the Vytians suppose to possess a peculiar cooling quality, and prepare with it a liniment for the head. The use of these Lichens in the form of a poultice placed over the renal and lumbar regions to produce diuresis is noticed in the Pharmacopœia of India, but it appears to be doubtful whether the application of heat and moisture in any other way would not be equally efficacious. A species of Parmelia will be found described in Arabic and Persian works on Materia Medica under the name of Hazáz-el-sakhar, or *Rock scab*; when rubbed between the hands it gives an orange colour, whence the name Henna of the Koreish above mentioned. The Persians call it Gul-i-sang, and consider it to be discutient and a good remedy for scabby affections of the skin; it is thought to be very cooling when applied externally.

FUNGI.

Polyporus officinalis, *Fries. Vern.*—Ghárikún. This is the Agarikon of Dioscorides* and the white Agaric of European medicine, imported into Bombay from the Red Sea and Persian Gulf ports. It is commonly kept by native druggists, being an important article in the Materia Medica of the Mahometans, who prescribe it in a great number of disorders, but generally in combination with other drugs on account of its purgative properties. According to their hakíms it acts principally by expelling cold and bilious humours. A figure and description of this substance will be found in Guibourt's History of Drugs, 6 Ed., Vol. II., p. 45. The active principle *Agaricin* has recently been recommended in Europe in doses of $\frac{1}{12}$ to $\frac{1}{6}$ of a grain as an astringent to check night sweating and diarrhœa, to diminish bronchial secretion, and to dry up the milk after weaning. A thin section soaked in glycerine shows under the microscope that the fungus is composed of a branching network of tubular fibres supporting a large quantity of granular and cellular material, amongst which may be seen numerous colourless refractive particles, which are probably resinous. Berkeley describes the hymenium as concrete with the substance of the pileus, consisting of sub-rotund spores with their simple dissepiments. White Agaric has been analysed by Bouillon-La-Grange, by Bucholz, by Braconnot, and by Bley. The constituents according to Bley are resin, 33·1; extractive, 2; gum and bitter extractive, 8·3; vegetable albumen, 0·7; wax, 0·2; fungic acids, 0·13; boletic acid, 0·06; tartaric and phosphoric acids, 1·354; potash, 0·329; lime, 0·16; ammonia and sulphur, traces.

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* Dios. iii., 1, *περὶ αγαρικοῦ*.

The active principle of Agaric has usually been said to reside in the resin, but a white amorphous bitter powder (laricin) has been separated from it, the formula of which according to Will is $C^{14} H^{12} O^{4}$. Martius considers this to be the active principle. Fleury, J. Pharm. Chim. (4) XXI., 279 to 284, gives the following result of an examination of the drug:—Five hundred and eighty grams. of the powdered fungus, not previously dried, were exhausted successively with ether, alcohol, cold water, boiling water, water acidulated with hydrochloric acid, and water rendered alkaline with potash, and the resulting solutions were examined:—

1. The ether extracts a resin, and a body to which the name of Agaric acid is given. The examination of several salts of this acid yielded results so discordant that no definite formula could be obtained, but the nearest approaches to accuracy lead to the supposition that its formula may be $C^{24} H^{44} O^{7}$. Efforts made to determine the basicity of the acid were unsuccessful. It is shown that the addition of the elements of water to the resin represents the composition of the agaric acid. After heating with very dilute sulphuric acid, a substance is yielded which reduces the cupro-potassic liquor. The agaric acid amounts to about one-fifth of the weight of the fungus.

2. The alcoholic solution has a very red colour, due apparently to the air, and on evaporation yields a residue of the consistence of hard wax, from which ether dissolves a resinous body soluble in alkaline liquids; its reaction is acid, it is not crystallizable, and it contains 1·5 per cent. of nitrogen. It

combines with metallic oxides. The remainder behaves like a resin; it is reddish, nitrogenized, fusible below 100°, forms viscous solutions with alkalies, and gelatinous precipitates with other bases.

3. The cold water yields a red solution, which on concentration deposits calcic and possibly also magnesic oxalate in microscopic crystals, while the solution contains a brown resinous nitrogenous body, considered to be identical with Boudier's viscosin.

4. Boiling water extracts a small quantity of a nitrogenous substance.

5. Water acidulated with hydrochloric acid (2 per cent.) yields a yellowish solution containing lime, iron, magnesia, and oxalic, phosphoric and malic acids.

6. Water containing 2 per cent. of potash yielded a solution which, on treatment with hydrochloric acid, deposited a flocculent substance unacted upon by acetic or phosphoric acids, and containing 3·12 per cent. of nitrogen.

The remainder, after this treatment, is a whitish flocculent substance; on drying at 100° it blackens and coheres, yet its microscope appearance does not differ from the original aspect of the fungus. It contains 1·21 per cent. of nitrogen, and affords on calcination 2 per cent. of ash containing lime, iron, magnesia (chiefly), potash, and sulphuric and phosphoric acids. The body possesses all the properties of fungin.

The following is the tabulated result of the analysis:—

Water	9·200
1. Resin and agaric acid	60·584
2. Another resin with magnesia sulphate	7·282
3. Resinous body with lime and magnesia	2·514
4. Nitrogenous substance with salts	1·900
5. Oxalate, malate, and phosphate of calcium, iron, &c.	1·058
6. Nitrogenous substance soluble in potash	7·776
Fungin	9·686
	100·000

Agaricus ostreatus, *Jacq. Vern.*—Phanas-alombé (*Mar.*), *Vulg.* Phanasámba. This is a dark snuff-coloured fungus, which grows upon the stumps of old Jack trees (Phanas). It consists of a short thick stalk which supports a flat woody pileus having a considerable resemblance to an oyster shell, and consisting of a number of laminæ, upon the under surface of which is situated the hymenium.

Phanas-alombé is ground to a paste with water and applied to the gums in cases of excessive salivation. It appears to have much the same properties as amadou, and to be a useful styptic. It is also given internally in dysentery and diarrhœa, and applied to the mouths of children suffering from aphthæ. The name means "Jack-tree fungus" or "mushroom"; that which grows on the variety of Jack known as *Kápe-phanas* is preferred.

ALGÆ.

Sphærococcus compressus, *Ag.*
Gloiopeltis tenax, *J. Ag.*
Gelidium cartilagineum, *Gaill.*
,, **corneum**, *Lam.*
} The dried jelly (*Gélose*).

Vernacular.—Chinai-ghás (*Bomb.*)

History, Uses, &c.—This substance, called Yang-tsai by the Chinese, and known in Europe as Mousse de Chine, Agar-agar and Japanese Isinglass, is a regular article of commerce in Bombay, where it is valued on account of its supposed strengthening properties. Hanbury (Pharm. Journ. (II.), Vol. I., p. 508,) gives the following account of it:—"Under the incorrect name of *Japanese isinglass*, there has been lately imported into London from Japan, a quantity of a substance having the form of compressed, irregularly four-sided sticks, apparently composed of shrivelled, semi-transparent, yellowish-white membrane; they are eleven inches long by from 1 to 1½ inches broad, full of cavities, very light (each weighing about 3 drachms), rather flexible but easily broken, and devoid of taste and smell. Treated with cold water, a stick increases greatly in volume, becoming a quadrangular, spongy bar with somewhat concave sides 1½ inches wide. Though not soluble in cold water to any important extent, the substance dissolves for the most part when boiled for some time, and the solution, even though dilute, gelatinizes upon cooling. The substance under notice is used by Europeans in China as a substitute for true isinglass, for which many of its properties render it highly efficient. That which is perhaps most distinctive is its power of combining with a very large proportion of water to form a jelly. This property is due to the principle named by M. Payen *Gélose,* of which the Japanese sea-weed product mainly consists. The jelly formed by boiling this sea-weed product or crude gélose in water, and allowing the solution to cool, requires a high temperature for fusion, differing in this respect from a jelly made of isinglass, which readily fuses and dissolves in warm water. This character occasions a peculiarity in the taste of culinary jellies made of the new material, inasmuch as they do not dissolve in the mouth as ordinary animal jelly. The jelly of gélose is but little prone to undergo change; so little indeed that sometimes under the name of *Sea-weed jelly* it is imported to this country from Singapore, sweetened, flavoured and ready for use, and in this state it may be kept for years without deterioration." Of late it has been much used for the purpose of Bacteria culture according to Koch's method.

Chemical composition.—According to Payen, gelose in a pure state constitutes an immediate peculiar principle, insoluble in alkaline solutions of soda, potash, and ammonia, as well as in water, alcohol, ether, and dilute acids. One of its distinctive characters, which is quite peculiar, is that of dissolving slowly in a very small quantity of concentrated sulphuric or hydrochloric acid, which it colours brown, forming with one or other of them a brown compound, which gradually solidifies, and which resists washing in cold or hot water, and even in caustic alkaline solutions. This new immediate principle cannot be confounded with any other. The ultimate analysis of gelose presents the following results:—Carbon 42·77, Hydrogen 5·775, Oxygen 51·445. As it has not yet been possible to form with it any definite combination, from which its equivalent weight or rational formula could be deduced, it must for the present be ranked among the immediate principles having oxygen exceeding the proportion necessary to form water with the hydrogen they contain. Gelose differs from animal gelatine in not precipitating tannic acid; from starch jelly in not being rendered blue by iodine; from gum, by its insolubility in cold water, and its great gelatinising power. From the mucilage of Chondrus crispus, named by Pereira Carageenin, it appears to differ chiefly in its power of combining with a great amount of water to form a jelly, which is not the case with carrageenin.

Commerce.—The term Chinai-ghas is loosely applied in Bombay to three substances, *viz.*, Japanese isinglass, edible birds'-nests, and Ceylon moss (Gracilaria lichenoides, *Grev.*)

Note.—This substance has attracted considerable, attention in France. It was exhibited at the Paris Exhibition of 1878 under the name of Thao. The following particulars from the catalogue may prove interesting. Various trials have been made with it in France since 1874, especially by MM. D. Gantillon and Co., at Lyons, and the Industrial Society at Rouen. The thao is prepared for use in the following way:—After having been soaked in cold water for about twelve hours, it is boiled for a quarter of an hour, during which it absorbs about 100 times its weight of water. If allowed to cool it becomes a jelly, but if passed through a sieve and stirred until cold it remains fluid, and in this state is more easily employed than when hot. The yellowish matter which some specimens contain can be removed by boiling for some time, when it forms an insoluble scum, which appears to consist of very thin fibres, and which remain attached to the sides of the vessel.

A singular property, and one which perhaps might be turned to valuable account is, that thao jelly does not decompose solution of permanganate of potash even when left in contact with it for twenty-four hours.

According to M. Heilmann, of Rouen, thao produces, in the proportion of 1 part to 100 of water, a dressing, which is supple and strong, and which gives substance rather than stiffness to calico, while dextrine, like starch, makes the tissue drier and harder, and gives less facing to the thread. The addition of glycerine gives a dressing still more flexible and soft, and while rendering the tissues less stiff, it communicates more body to them.

The addition of talc gives still greater smoothness. Once dissolved, according to M. Gantillon, thao will mix while hot with any gum, starch, dextrine or gelatine. The principal advantage of thao in dressing silk fabrics is that while preserving their suppleness it gives them greater glossiness and makes them soft to the touch. The mixture of thao with gum tragacanth is said to be the best method of using it. Thao should, however, be used alone for materials which it is not necessary should be stiffened. As thao is only soluble at a high temperature, a moist atmosphere, fog, or even rain does not affect the material dressed with it.

It combines well with sulphate of copper and the chlorides of aniline and potassium, and can be used in double dyeing.

It also answers well for sizing paper, &c. The only obstacle to its extensive use is its high price. There is, however, no reason why a similar substance should not be made from our common native seaweeds, of which Gelideum corneum and Gracilaria confervoides approach most nearly in character the algæ from which thao is made. Gélose, of which thao consists, differs from the carrageenin obtained from Chondrus crispus in its power of combining with a very large quantity of water to form a jelly; it yields ten times as much jelly as an equal weight of isinglass. For purposes of food thao jelly is not quite so pleasant as animal jelly, as it does not melt in the mouth; it also contains no nitrogen. A great advantage which it possesses is, that it is but little prone to undergo change, so much so that the jelly is sometimes imported from Singapore, sweetened, flavoured, and ready for use, and may in this state be kept for years without deterioration. The West Coast of

Australia also yields a seaweed possessing similar properties, which will be referred to under that country.

Gracilaria lichenoides, *Grev., Bentl. and Trim., t.* 306, The plant.

Syn.—Sphærococcus lichenoides, *Ag.* non *Grev.*

Vernacular.—Chinai-Ghás (*Bomb.*)

History, Uses, &c.—Ceylon moss or Agar-agar has long been used in Southern India and Ceylon as a nutritive, emollient, demulcent and alterative, especially valuable in pectoral affections. It has been described by Rumphius, Gmelin, Turner, Nees, Agardh, and O'Shaughnessy. (Confer. Pereira's Materia Med., Vol. II., Pt. I., p. 13.) It grows abundantly in the large lake or backwater which extends between Putlam and Calpentyr, and is collected by the natives principally during the south-west monsoon when it becomes separated by the agitation of the water. The moss is spread on mats and dried in the sun for two or three days, it is then washed several times in fresh water, and again exposed to the sun, which bleaches it. The following directions for using the moss are given in the Bengal Pharmacopœia, p. 276:—For a decoction, take 2 drachms ground to fine powder, water 1 quart, boil for 20 minutes and strain through muslin. By increasing the proportion of the ground moss to half an ounce, the filtered solution on cooling becomes a firm jelly, which when flavoured by cinnamon or lemon peel, sugar and a little wine, is an excellent article of light food for sick children and convalescents.

Description.—Ceylon moss is in whitish or yellowish-white ramifying filaments of several inches in length (when unbleached it is purple). At the base the largest fibres do not exceed in thickness a crowquill; the smallest fibres are about as thick as fine sewing thread. To the naked eye the filaments appear almost cylindrical and filiform; but when examined by a microscope, they appear shrivelled and wrinkled. The branchings are sometimes dichotomous, at other times irregular.

The coccidia are inconspicuous when dry, but when moist are readily seen. They are hemispherical, about the size of a poppy seed, and contain a mass of minute oblong, dark-red spores. The consistence of Ceylon moss is cartilaginous. Its flavour that of seaweed, with a feebly saline taste. (Pereira's Mat. Med., Vol. II., Pt. I., p. 14.)

Microscopic structure.—Frond composed of large oblong cylindrical cells, containing granular endochrome, those of the surface forming moniliform, densely-packed filaments. Fructification of two kinds—1*st*, hemispherical coccidia, containing a glomerule of oblong spores on a central placenta, within a pericarp of moniliform densely crowded filaments; 2*nd*, oblong tetraspores imbedded in cells of the surface. (Endlicher.)

Chemical composition.—This algal has been examined chemically, in 1834, by O'Shaughnessy; in 1842, by Guibourt; and in 1843, by Wonneberg and Kreysiig, by Bley and by Riegel. O'Shaughnessy found it to consist in 100 parts of vegetable jelly 54·5, starch 15·0, ligneous fibre (cellulose?) 18·0, mucilage 4·0, inorganic salts 7·5. The authors of the Pharmacographia state that, "Cold water removes the mucilage, which after due concentration may be precipitated by neutral acetate of lead. This mucilage when boiled for some time with nitric acid, produces oxalic acid and microscopic crystals of mucic acid, beautifully seen by polarised light, soluble in boiling water and precipitating on cooling. With one part of the drug and 100 parts of boiling water, a thick liquid is obtained, which affords transparent precipitates with neutral acetate of lead or alcohol, in the same way as carrageen. With 50 parts of water, a transparent tasteless jelly, devoid of viscosity, is produced; in common with the mucilage, it furnishes mucic acid, if treated with nitric acid. Micro-chemical tests do not manifest albuminous matter in this plant. Some chemists have regarded the jelly extracted by boiling water as identical with pectin, but the fact requires proof. Payen called it Gélose. (See last article.) The inorganic salts of Ceylon moss consist, according to O'Shaughnessy, of sulphates, phosphates, and chlorides of sodium and calcium, with neither iodide nor bromide.'' Bley found iron, silica and iodic salt in the ashes.

Commerce.—See last article. This substance is preferred to Japanese isinglass by the Hindus, as they suspect the latter substance to be of animal origin. Value, Rs. 12 per cwt.

Ulva latissima, *Linn.*

This seaweed grows on rocks in the sea at Manora, Sind, and is administered in scrofulous diseases.

Porphyra vulgaris, *Ag.*

Manora rocks, Sind, *Vern.*—Las. It contains much gelatinous matter, and is administered in scrofulous diseases.

Laminaria saccharina, *Lam., Turn. Fuci., t.* 163.

Sind, *Vern.*—Galhar ka patta. As an article of commerce this weed is said to find its way from the Caspian into India. When dried in the sun it exudes a whitish substance resembling manna. Medicinally the plant is employed in Sind for the cure of scrofulous affections. In syphilitic eruptions it is a favourite remedy, exhibited in the form of a syrup in conjunction with a decoction of Quince seeds. (Murray.)

Chondrus crispus, *Lyngbye, Bentl. and Trim., t.* 305.

Carrageen or Irish Moss is found on Manora rocks, Sind.

Husn-i-yusuf (*Pers.*), **Hashish** (*Arab.*)

Described as small, hard, white bodies or seeds rather smaller than Poppy seeds. They are excessively acrid, and are only applied externally as a rubefacient. The Husn-i-yusuf of the Punjab is a diatom found floating in lakes in Kashmir, it is of a triangular shape ; it would appear to be the same as the Shuka of Sanskrit medical writers, which was rubbed in to increase venereal excitement ; its use seems to have been much abused, as we find *Shukadoshanimittavyadhayah* (sores caused by Shuka) treated of as a disease by Susruta.

The Madhukosha describes Shuka thus—

शूको जलशूकः । यस्तु विषजंतुर्जलमण्डूकः स शूकः । शूकप्रधानो वात्स्यायनाद्युक्तो योगो लिंगवृद्धिकरः स शूक उच्यते । सटीकनिदानम् ।

Calcutta Ed., p. 289.

APPENDIX A

UNDETERMINED DRUGS.

Bozidan (*Pers.*) ? **Mitha-aqarqarha** (*Bomb.*)

The source of this root has not been ascertained. Serapion, Ibn Sina, Ibn Baitar, and the Persian writers say that it is of Indian origin, and that Bozídán or Bozandán, is a Hindi word. The Bombay name means "Sweet Pellitory." The drug certainly has a resemblance to Pellitory root, but is usually rather larger and of lighter colour ; externally it is rough and furrowed, internally hard and whitish ; taste sweet. The hakíms consider it to be aphrodisiac, tonic, deobstruent, useful in rheumatism and gout, and in enlargements of the liver and spleen. They also state that it has abortifacient and anthelmintic properties.

Bombay is said to be supplied with the drug from Surat, but whether it is collected in that neighbourhood is not known. Some say the root comes from Delhi.

Barkak-i-Shirazi. The root, Ud-i-bari and Ud-el-binduk.

Said to be powerfully intoxicating and poisonous.

Dhudiya Hemkand (*Guz.*)

A twisted, crooked root about as thick as the finger. Bark brown, of a chestnut hue where it has been exposed to friction, furrowed longitudinally, cracked transversely here and there, marked with numerous elliptic light-coloured corky warts. Wood arranged in about four concentric rings, easily separated one from the other, porous, yellowish, no particular odour, taste mucilaginous and acrid. The root looks like that of an Asclepiad ; it is chiefly used as an external application.

Afimedun.

A root having little taste or smell, small, of a black colour, occasionally met with in Indian bazars. It is supposed to produce sterility. The name is a corruption of the Greek ; it is also called Fafiyús. Mîr Muhammad Husain says that the plant consists of a single stem, has never more than twelve leaves, and bears no flowers or fruit. The dose is three miskals.

Sarakhs, (*Pers.*)

A dark reddish-brown, knotty, fibrous root, with aperient properties, said to be the Bafaras of the Greeks, called in Hindi Kil-daru and Basúra, in Bengali Pankhraj.

Gajpipal of Bombay.

Under the name of Gaj-pipal several drugs appear to have been used in different parts of India. Roxburgh tells us that Gaj-pipal is the fruit of Pothos officinalis, a climbing plant belonging to the Araceæ. He also says that the plant described by Sir W. Jones under the same name is his Tetranthera apetala. On the authority of Mr. Rahim Khan of Lahore, a kind of Gaj-pipal has been referred to Plantago amplexicaulis. The drug sold under this name in Bombay is certainly not derived from P. officinalis or Plantago amplexicaulis. Messrs. S. Arjun and N. M. Khansahib consider it to be the entire plant of a Balanophora. As sold in the shops, several plants, more or less injured, may be seen growing in clusters from a piece of stick. The largest are about 5 inches in length, and consists of a kind of cellular cup, from which springs a scaly spadix surmounted by a glandular-shaped mass of imperfect flowers, beneath which the tsem is marked by little pits showing the place where the female flowers were attached. The drug is mucilaginous and astringent.

Hamama, Amamun, or **Amuman.**

The drug sold under this name in Bombay exactly corresponds with the figure of Amomum in the Exotica of Clusius, and appears to be a moss. It occurs in tufted masses, the size of a man's fist or larger, and reminds one of the sphagnum seen in turf bogs in Europe. Persian writers speak of several kinds of the drug; one of these is said to grow in water. Hamama does not in the least agree with Dioscorides' description of Amomun.

Kanturiyum, *κενταυρίον*, under this name small woody stems, from the tops of which spring numerous round, slender, jointed branches, are sold in Bombay. They come from Persia, and are supposed by the hakíms to represent the *κενταυρίον* of Dioscorides. The stems in question are certainly not those of Chironia Centaureum; they are round with tumid joints, which are furnished with bracts, and resemble the stems of a pink; towards the upper part the stem becomes obscurely angular, and terminates in a single flower or capsule about 1 inch in length. The leaves are linear.

Anjubar-i-Rumi.

A thick, reddish brown, astringent, fibrous root-bark, certainly not Bistort. Mír Muhammad Husain says it is the root of a climbing plant, with reddish stems and red flowers, a native of Syria, growing on river banks. As a medicine it seems to be purely and powerfully astringent.

Patal-tumri.

S. Arjun supposes this drug to be the bulb of Ceropegia acuminata or bulbosa. The specimens I have met with appear to be a species of Bovista or Puff-ball about the size of a small bantam's egg, black and smooth externally, apex slightly depressed, at the other end a constricted portion, like a small stalk. Substance internally white and pith-like, mucilaginous, and a little bitter to the taste when chewed. The drug is used in the bowel complaints of children.

Certain species of Bovista and Lycoperdon have been found on analysis to contain glucose, gum, pectose and cellulose. The smoke of the common puff-ball is narcotic; it contains carbonic oxide; when eaten it is said to produce a narcotic effect. (Stillé and Maisch. National Dispens., p. 864.)

Itrilal اطريلال. In the language of the Barbar a herb which is also called Rijl-el-ghuráb, and in the present day Zir-el-akhilleh, resembling the Shibith (Anise) in its stem and in its node, whence the flower grows, جُمَّة. and in its lower part, or root, except that its flower is white and it forms grains like those of Parsley. A drachm of its seeds bruised and mixed with honey is a tried remedy for leprosy. (Madd-el-Kámús.) In Bocthor's Dict. Français-Arabe, both the names of Rijl-el-ghuráb and Itrilál are given to cerfeuil (Chervil) and Corne de cerf (Buckshorn plantain).* In the Tuhfat-el-Muminín the seeds are described as bitter, carminative and deobstruent.

Fashara (*Arab.*), Hazár-fishán, Hazár-kashán, Márdárú, Karam-i-dashti (*Pers.*), Halílútan (*Turk.*), Aghlítús (*Greek*), Arjálún (*Barbari*), Karmat-el-baidát (*Arab.*) An astringent and bitter root said to have alterative and tonic properties, supposed to be a kind of Bryony. It is said to be the root of a climbing plant like a vine, which bears bunches of red berries. The root is about the size of Costus, and somewhat resembles it.

Kakalia, *κακαλία*. Baklat-el-awjaa (?)

A name applied by Dioscorides to a mountain plant with large whitish leaves. By some it is thought to be Cacalia alpina. Sprengel thinks it is Bupleurum longifolium. (Confer. Dioscorides iv., 118.)

Kilkil and **Hab-el-kilkil** (*Arab.*)

There seems to be much doubt as to what the original Kilkil was. In the Kámus it is described as a plant having aromatic black seeds, and

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* Plantago Coronopus, the *κορωνόπους* of the Greeks.

Kulkulán as a medicine prepared from Kilkil powdered and mixed with sesamum and honey, which is used as an aphrodisiac. In the Makhzan, Anárdáneh-i-dashti is given as a Persian and Gúar-chikneh as an Indian synonym, but the author seems doubtful as to the identity of the drug. Forskahl gives Kulkul as a name of Cassia tora. (Flor. p. 86.) Various drugs are supplied as Kilkil in India; they are probably all fictitious.

Tejbul of Bombay.

A soft, light, reddish bark about half an inch thick, in irregular pieces, often as large as the palm of the hand, trimmed, the epidermis being removed and the inner surface scraped; sometimes it is deeply fissured. The structure is like that of cork, only much coarser, which gives it a glistening appearance. The cells are about six times the size of cork cells. This bark is sold by all the herbalists, and is always kept saturated with water, so that on breaking it, it appears to be full of juice; it is evidently obtained somewhere in the Concans not far from Bombay, but all attempts to discover its source have failed. It is sold to the credulous as an aphrodisiacal tonic.

Soukanu or **Karu Karkora.**

A climbing shrub, the bark of which is used as an external application to relieve pain. The bark is whitish-brown, externally corky, and regularly marked with longitudinal fissures.

Bazr-el-ratab (*Arab.*), **Tukm-i-aspast** (*Pers.*)

A small yellowish seed, supposed to be that of some kind of clover. It is used as a fattening tonic.

Narki-cha-kanda.

Appears to be the tuber of a Curcuma. The specimen came from Poona.

Anchanchak or **Anjukak.**

The seeds are said to be those of a species of Pyrus growing in Persia; they resemble large pear pips, and are edible. They are regularly imported into Bombay.

Dorgunj.

An amylaceous root which very closely resembles the Asgand of the shops. The specimen came from Poona.

Bazr-el-katif (*Arab.*), **Tukm-i-sarmak** (*Pers.*)

Said to be the seeds of a kind of spinach; some say that it is the Bathooa of Hindustan, which is Chenopodium album.

Properties deobstruent and diuretic.

Pandhra-poti-akola.

A root, an inch or more in diameter, with a light grey bark, marked with transverse corky warts ; substance consists of very coarse woody columns, between which is a quantity of soft gummy substance ; taste gummy. Said to be tonic and aphrodisiac.

Kala-poti-akola.

A somewhat flattened, ovoid, pendulous tuber, 3, 4 or more inches long ; externally black, internally yellowish, translucent and gummy ; taste sweetish, mucilaginous. Said to be tonic and aphrodisiac.

Ragat-rohini.

A root, half an inch or more in diameter, with a thick reddish-brown bark, marked with numerous transverse, warty fissures and longitudinal cracks, which cause the suber to exfoliate ; woody portion porous and cane-like ; taste a little sweet Said to be tonic and aphrodisiac.

Shamraj.

The stem of some creeper, cut into small pieces about half an inch long ; it is of a deep reddish brown colour, and in structure resembles the stem of a Vitis ; when steeped in water it is very mucilaginous. Used in gonorrhœa. Dose 1 to 3 drams.

Kamraj.

A reddish brown tuberous root, strongly astringent, doubtless the root of a Vitis ; it closely resembles the Bendri or Chamar-musli of the Bombay herbalists, which is Vitis araneosus, *Dalz.*

Ajanphal.

A drupe, of a greenish gray colour, about an inch long and $\frac{3}{4}$ of an inch broad, obovate, crowned by the calyx and 4 calycinal teeth ; on section it is seen to have a thin woody shell within the pericarpium, divided into 4 cells by woody septa, and each cell containing a number of kidney-shaped brown seeds $\frac{2}{12}$ of an inch in length, embedded in a grey pulp ; attached to the fruit were several cuneate-obovate coriaceous leaves, $1\frac{3}{4}$ by $1\frac{1}{4}$ inch.

Tipani-kand or **Tiphan-kand.**

A scabrous, shrivelled, flat, tuberous body, of an ovoid form, from each end of which issues a thin woody root, substance of tuber, which is hollow in the centre, suberous ; it appears to be an abnormal development of the suberous tissue of the root upon which it is formed. Described as acrid but not poisonous.

Bari-mishri.

A very hard, heavy, dull grey, tuberous root, 3—4 inches long and about 1 inch in diameter at the thickest part; a small quantity scraped from it showed that the root is composed of small cells filled with needle-shaped crystals, which escape and occupy the field of the microscope. The root is mucilaginous and has a saline taste. It is used in *Paushtiks* (strengthening medicines).

Tejraj.

A stem (probably of a species of Vitis), cut in pieces rather more than an inch in length, of a light reddish brown colour and mucilaginous taste.

Nibhalkand.

A soft, dirty white, mucilaginous and starchy tuber, with a brown cortex, cut in circular pieces like Calumba, taste insipid, used in *Paushtiks*, probably the tuber of a Curcuma.

Tupwel.

The stem apparently of a Menispermaceous plant, ¾ inch diam., bark brown, marked by transverse warty fissures; taste insipid. Said to be used as a diuretic.

Ban-shingara.

Small bilobate tubers of an orchidaceous plant, many of them nearly triangular in form like *shingara*; they are threaded upon a string, and are used like Salep.

Bhojraj.

The stem of a plant (probably a Vitis), cut in short pieces about ¾ inch long; it is flat and divided by grooves into 3 columns, 1 inch broad, and rather more than ¼ inch thick; taste mucilaginous. Used in gonorrhœa.

Surjanwari.

Small, brown, shrivelled, gummy roots, in short pieces (½ to 1 inch), having a thin central woody portion like Ipecacuan. Taste insipid. Used like other gummy drugs as a restorative.

Gurmali.

A woody creeper, with fruit the size of the Jambúl. The oil of the seeds is used to promote the healing of wounds.

Kumbhraj.

An elongated, starchy, heavy tuber, of a pinkish brown colour; cut in pieces an inch and a half long. Used in *Paushtiks.*

Bijanwari.

A small brown root, stocks and rootlets of a starchy nature, from $\frac{1}{8}$ to $\frac{2}{8}$th of an inch in diameter.

Dudhia-mishri.

A dirty white, coarse powder, apparently of some stem or root; gummy and mucilaginous. Used in *Paushtiks.*

Gunja-gawat.

A grass growing by the seaside, like Durva, 3 feet high, used as fodder and for thatching. In intoxication and bilious giddiness it is pounded with water and the juice applied to the head.

Golun.

A small, grass-like plant. In bilious dyspepsia 2 tolas of the dried plant with 6 massa of Adansonia pulp, and 2 tolás of sugar, is made into a क्काढा (decoction) and administered. The plant is also used to kill ticks.

Dhaiali

A large creeper, of a whitish colour, with reflexed thorns. It is used to disperse glandular swellings and to cure dysentery.

One-eighth of a seer of the juice is mixed with a quarter seer of buttermilk and given; it must be taken at once, or else it will coagulate.

Nir or Ner.

A kind of grass, the seeds are roasted and shelled, and applied to buboes, scald head, and the eruption of small-pox, to promote suppuration; they may be mixed with Maida-lakri, or Wajrmut (Synantherias sylvatica).

Makadi.

The flowers pounded in milk are given for whooping cough, and a necklace of them tied round the patient's neck.

Mirjoli.

A parasitic plant, used medicinally.

Morshikha.

A creeper, also called Mormaushi.

Boranti.

A creeper, with leaves like the Jujube, and sharp prickles.

Phurwin.

A creeper, with leaves like Solanum Indicum.

Gurgindi.

A plant found about old houses and ruins, it is boiled in water, and the water used to wash new-born children to remove pimples.

Deonal-gawat.

A large grass used medicinally.

Kochrik.

A small tree, with strong smelling leaves, used in rheumatism.

Arwal.

A tree, the juice is used in snake-bite.

Kanwel.

A creeper worn as a bracelet to cure yawning.

Katriwel.

A creeper, has cooling properties.

Ringanwel.

A cucurbitaceous creeper, used to promote delivery.

Wentwel.

A convolvulus, common in fields, eaten by cattle, and given to stop movements of the child *in utero.*

Sonarwel.

A creeper, said to be medicinal.

Hil-bawa.

The Nutmeg Cardamom, or true Cardamomum majus,* has this year (1885) made its appearance in the Bombay market. Up to the present time the only large cardamoms I have met with have been the Bengal or Ceylon kinds. Hil-bawa or Kákulah-i-kibár is correctly described by the Arabian physicians, who no doubt were acquainted with the genuine article. Persian and Indian writers are evidently not acquainted with it, although they copy the description given by the Arabs. Ibn Sina merely says, " It is the same as Khair-bawa, and is the sweetest kind of cardamom."

The Pharmacographia has the following account of this rare Cardamom :—" The true *Cardamomum majus* is a conical fruit, in size and shape not unlike a small fig reversed, containing roundish angular seeds, of an agreeable aromatic flavour, much resembling that of the Malabar cardamom, and quite devoid of the burning taste of grains of Paradise. Each fruit is perforated, having been strung on a cord to dry; such strings of cardamoms are sometimes used by the Arabs as rosaries. The fruit in question is called in the Galla language *Korarima*, but is also known as *Guragi* spice, and by its Arabic names of *Heil* and Hab-el-habashi. According to Beke it is conveyed to the market of Báso (10° N. lat), in Southern Abyssinia, from Tumhé, a region lying in about 9° N. lat. and 35° E. long.; thence it is carried to Massowah, on the Red Sea, and shipped for India (?) and Arabia. Von Henglin speaks of it as brought from the Galla country. It is not improbable that it is the same fruit which Speke saw growing in 1862 at Uganda, in lat. 0°, and which he says is strung like a necklace by the Wagonda people."

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* Valerius Cordus, Hist. Plant. iv., 28. Mathiolus i., 27.

"Pereira proposed for the plant the name of Amomum Korarima, but it has never been botanically described.—*Op. cit.*, 2nd Ed., p. 650.

APPENDIX B.

ORIENTAL WEIGHTS.

ARABIC, FROM THE MISBAH.

رطل *Ratl*, according to the standard of Baghdad, twelve ounces; the *ounce* (اوقية) being an *istar*, (استار) and two-thirds of an istar; and the istar being four *mathákil* (مثاقيل) and half a *mithkál* (مثقال); and the mithkal being a *dirham* (درهم) and three-sevenths of a dirham; and the dirham being six *dowánik* (دوانق) and the *dánik* (دانق) being eight *habbáb* (حباب) and two-fifths of a *habbah* (حبة); so that the ratl is ninety mathákil, *i.e.*, one hundred and twenty-eight diráham and four-sevenths of a dirham; or, according to A' Obeyd, 128 dirhams of the weight of seven* or twelve ounces, the ounce, *i.e.*, the ounce of the Arabs being 40 dirhams, so that the whole is 480 dirhams. The dirham is 48 grains and the modern mithkál $1\frac{1}{2}$ dirham instead of $1\frac{3}{7}$ dirham.

PERSIAN WEIGHTS.

نخود nukhúd, a grain of Cicer arietinum = $\frac{1}{144}$ ounce avd. about.

24 nukhúd = 1 مثقال (miskál) nearly $\frac{1}{6}$ of an ounce avd.

90 miskál = 1 وقه (vakkah) about 14 ozs. avd.

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* "In the time of Ignorance some dirhams were of the weight of 20 carats and were called the *weight of ten* (*i.e.*, of 10 daniks); and some were of the weight of ten carats and were called the *weight of five*; and some were of the weight of twelve (carats) and were called the *weight of six*, and they put the three weights together and called the third part thereof the weight of seven." (Madd-el-Kamus.)

8 vakkah = 1 من تبريزي (Tabriz man) 7¼ to 7½ lbs. avd.

The man-i-Shahi or Royal man is from 14½ to 15 lbs avd.

The man-i-Rai or man of Rai nearly 30 lbs avd.

The man-i-Hashimi or Hashimi man used only in the South is 116 lbs. avd.

The Chárik is a quarter of a man, usually of the Tabriz man, but sometimes of the Royal man.

The Bátmán is a Turkish weight used in Western Persia, nearly 15 lbs. avd.

The Kirát is an Arabian weight of from 3 to 4 grains varying in different parts of the country. (See note on Arabian weights.)

INDIAN WEIGHTS.

(*From Dutt's Hindu Materia Medica.*)

18 mustard seeds, 4 grains of rice, 3 grains of barley, or 2 grains of wheat = 1 Gunja गुंज Raktrica or Ratti = 1·84 of a Troy grain about.*

6 Gunjás = one án^{a} आना.
12 Gunjás = one máshá माषा.
8 Máshás or 16 ánás = one tolá तोला.
8 Tolás = one pala पल.
8 Palas or 64 tolás = one seer सेर.
2 Seers = 1 prastha प्रस्थ.
8 Seers = 1 ádhaka आढक.
32 Seers = 1 drona द्रोण.
100 Palas or 12½ seers = 1 tulá तुला.

In the above scale 96 gunjás make one tolá; it would seem, however, that in ancient days Susruta's scale of 40 gunjas to a tolá was in general use, as the doses given in the older works appear to us enormous. There is a peculiarity in fluid measures which must also be noticed. When a fluid article is ordered in measures of a prastha or two seers and upwards, twice the quantity mentioned should be taken. In measures below two seers, or in those indicated by pala, such as 80 palas, 60 palas, &c., the quantities are not doubled. (*Op. cit.*, p. 8.)

The curious will find an account of the different weights and secret signs used by Mahometan physicians in the Tuhfat-el-muminin.

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* The seeds of Abrus precatorius vary considerably in weight. Dr. Warden found the mean weight of the red variety to be 1·75, of the black 1·77, and of the white 1·97 grains.

APPENDIX C.

LIST OF WILD PLANTS AND SEEDS USED AS FOOD DURING THE DECCAN FAMINE OF 1877-78.*

List from Poona District.

Vernacular name.	Part of Plant used.	Scientific name.
Rán-shewrá	Seeds	Sesbania aculeata and procumbens.
Kená........................	Do.	Cyanotis axillaris.
Jondhali	Do.	Coix lacryma.
Dudháni	Follicle	Oxystelma esculentum.
Unháli	Seeds	Tephrosia purpurea.
Rán-sáwá	Do.	Oplismenus colonus.
Lándagá	Do.	Oxalis corniculata.
Kusari	Do.	Jasminium latifolium.
Torne......................	Fruit	Zizyphus rugosa.
Yel..........................	Seeds	Terminalia bellerica.
Dhoti......................	Do.	Spermacoce hispida.
Kalki	Do.	Bambusa arundinacea.
Pandhá	Do.	Indigofera linifolia.
Kulai......................	Do.	Crotalaria rostrata.
Dhápa	Seeds and herb.	Sesuvium portulacastrum.
Téré	Herb	Caladium ovatum.
Ghetoli	Do.	Boerhavia diffusa.
Kunjir	Seeds	Aerva lanata.
Kásodá	Leaves	Cassia sumatrana.
Hirandodi................	Do.	Hoya viridiflora.
Páthari	Herb	Microrhynchus sarmentosus.
Ghotwel	Leaves & root.	Smilax ovalifolia.
Shedwel	Herb	Pistia stratiotes.
Kawla	Do.	Smithia sensitiva.
Kurdu	Do.	Celosia argentea.
Bharangi	Do.	Clerodendron serratum.
Tarwat	Leaves	Cassia auriculata.
Dáhán	Herb	Euphorbia thymifolia.
Kavdar kand	Root	Musa ornata.

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* Many of these plants were identified at the time by Dr. W. Gray and Mr. Sakharam Arjun, the remaining identifications have been made during last rainy season from specimens of the plants, kindly collected for me by Mr. M. Pereira, of Bandora.

Vernacular name.	Part of Plant used.	Scientific name.
Chovaicha kanda	Root	Musa superba.
Pand kanda	Do.	Nelumbium speciosum.
Diva kanda	Do.	Tacca pinnatifida.
Badadha		Not identified.

List from Kaladgi District.

Plants always more or less used.

Jati	Herb	Cosmostigma acuminatum.
Mábli	Do.	Gynandropsis pentaphylla.
Kurdu	Do.	Celosia argentea.
Negli	Do.	Polygala chinensis.
Bárik ghol	Do.	Portulaca quadrifida.
Moti ghol	Do.	„ oleracea.
Moshiki	Do.	Tylophora mollissima.
Pitpápada	Do.	Rostellularia procumbens.
Tákla	Do.	Cassia Tora.
Vasanvel or Parvel	Do.	Cocculus villosus.

Eaten in times of Famine only.

Chinch	Leaves	Tamarindus indicus.
Gokhrú	Seeds	Tribulus terrestris.
Kudachincha	Herb and seeds	Corchorus trilocularis.
Gavat or Kena	Seeds	Cyanotis axillaris.
Bhui-taravad	Do.	Indigofera enneaphylla.
Gavacha malmandi	Do.	„ glandulosa.
Jawáricha malmandi	Do.	„ linifolia.
Kasili or Mudri	Do.	Abutilon muticum.

List from Khandesh District.

Chavlya kand	Root	Musa superba.
Javlya kand	Do.	„ ornata.
Muliya kand	Root	No specimens sent.
Bhendya kand	Do.	
Sutalya kand	Do.	
Dudha malida kand	Do.	Nelumbium speciosum.
Angar kand	Do.	No specimens sent.
Nágal kand	Do.	
Janglé kanda	Leaves	Urginea indica.
Jágalé kand		No specimens sent.
Mul kand		
Chincha	Leaves	Tamarindus indicus.

Vernacular name.	Part of Plant used.	Scientific name.
Pipal or Pimpar	Fruit	Ficus religiosa.
Bil	Do.	Ægle Marmelos.
Shindi	Do.	Phœnix sylvestris.
Kavatha	Do.	Feronia elephantum.
Khakara	Roots	Butea frondosa.
Boor	Dry fruit powdered.	Zizyphus Jujuba.
Mova	Flowers	Bassia latifolia.
Tembhuran	Fruit	Diospyros embryopteris.
Ambádi	Leaves & pods.	Crotalaria juncea.
Tarota or Takla	Leaves	Cassia Tora.
Chár	Fruit	Buchanania latifolia.
Babhula	Seeds	Acacia arabica.
Bibala or Honi	Seeds & flowers	Pterocarpus marsupium.
Bhokar	Flowers & fruit	Cordia latifolia.
Wasan	Leaves	Cocculus villosus.
Dodi	Do.	Hoya viridiflora.
Kardai	Leaves & seeds	Carthamus tinctorius.
Pháng	Leaves	Pogostemon purpuricaulis.
Gavatha	Seeds	Cyanotis axillaris.
Karola	Leaves	Bauhinia malabarica.
Mhais	Do.	Cissus edulis.
Támbul	....	Not identified.
Kedári	Herb	Leucas cephalotes.
Káman	Do.	Solanum nigrum.
Karli	Leaves	Momordica Charantia.
Dudhi	Do.	Oxystelma esculentum.
Bhurmi	Fruit	Zizyphus jujuba.
Savandal	Do.	Prosopis spicigera.
Abhita	Flowers	Bauhinia racemosa.
Kená	Seeds	Cyanotis axillaris.

List from Nasik District.

Kolon	....	Not identified.
Kená	Seeds	Cyanotis axillaris.
Tarota or Taroda	Leaves	Cassia Tora.
Kolu	....	Not identified.
Ghola	Herb	Mengea tenuifolia.
Pathari	Do.	Microrrhynchus sarmentosus.
Tamdulja	Do.	Amaranthus oleraceus.
Mokha	Leaves	Schrebera Swietenioides.
Chataveli	Do.	Dioscorea pentaphylla.

Vernacular name.	Part of Plant used.	Scientific name.
Diva	Root	Tacca pinnatifida.
Faji	Leaves	Dalbergia paniculata.
Saraté	Seeds	Tribulus terrestris.
Kunjar	Do,	Aerva lanata,
Bharangi	Seeds & flowers.	Clerodendon serratum.
Bodha	Herb	Cardiospermum halicacabum.
Chai	Do.	Alysicarpus vaginalis.
Kusmod	Leaves	Cassia sumatrana
Ambat vengali		Not identified.
Kurdu	Herb	Celosia argentea.
Dinda	Leaves	Leea macrophylla.
Teria	Do.	Caladium ovatum.
Susa		Not identified.
Sarmala	Herb	Cassia pumila.
Bokhar	Fruit	Cordia myxa.
Chavel	Herb	Cressa cretica.
Getan	Do.	Digera arvensis.
Ladundi chai	Do.	Alysicarpus vaginalis.
Diva	Root	Tacca pinnatifida.
Chavai	Do.	Musa superba.
Pandhé	Seed	Indigofera linifolia.
Chipalichai, also called Kuli and Phúrsí	Leaves	Chlorophytum parviflorum.
Badadia Lobhi		Not identified.
Kadu	Root	Ceropegia bulbosa.
Kava dodi	Do.	Bryonia laciniosa.
Vanda	Do.	An orchid.

List from Sholapur District.

Mukuya	Seeds	Phaseolus trilobus.
Ichka	Do.	Cyanotis axillaris.
Barbed	Seeds	Indigofera glandulosa.
Pandhara phala	Do.	,, linifolia.
Kásla	Do.	Abutilon muticum.
Dhámuké	Do.	Acacia arabica,
Bechaká	Do.	Indigofera cordifolia.
Saraté or Gokhrú	Do.	Tribulus terrestris.

Plants used during Famine Seasons not mentioned in the above lists.

Thurdoory baji	Herb	Leucas aspera.
Lobirsir baji	Do.	Sida cordifolia.
Nálichi baji	Do.	Ipomæa reptans.

Vernacular name.	Part of Plant used.	Scientific name.
Kulsanda	Herb	Asteracantha longifolia.
Mothe karamala	Calyx	Dillenia speciosa.
Asupálá	Fruit	Guatteria longifolia.
Jharasa	Herb	Mollugo pentaphylla.
Goladára	Seeds	Sterculia guttata.
Jangali badam	Do.	„ fœtida.
Shirala	Fruit	Grewia microcos.
Chowra	Do.	Erinocarpus Nimmonii.
Kosimba	Do.	Schleichera triguga.
Javasa	Green pods	Linum usitatissimum.
Bibba	Do. fruit	Semicarpus anacardium.
Ambata	Do.	Spondias acuminata.
Kuhili	Seeds	Mucuna pruriens.
Akola	Fruit	Alangium decapetalum.
Karambu	Do.	Syzygium Gibsonii.
Nhyu	Do.	Nauclea Cadamba.
Bhutakesa	Calycine leaves.	Mussænda frondosa.
Kíraní	Leaves	Canthium parviflorum.
Pendhari or Pendru	Green fruit	Randia uliginosa.
Abú	Do.	Vangueria edulis.
Barabati	Leaves	Embelia Busaal.
Kerni or Ránjana	Fruit	Mimusops hexandra.
Párájamba	Do.	Olea dioica.
Tulatuli	Flowers	Holostemma Rheedii.
Makar singh	Green follicles.	Caralluma fimbriata.
Bhauri or Gariya	Peduncles	Porana racemosa.
Do.	Do.	Ipomœa muricata.
Lana	Herb	Salsola indica.
Bhákavata	Do.	Chenopodium viride.
Machola or Ghuri	Do. pickled	Arthrocnemum indicum.
Chanda	Fruit	Macaranga Roxburghii.
Ambagula	Do.	Elœagnus Kologa.
Umbara	Do.	Ficus glomerata.
Súná or Kala	Tubers	Hedychium scaposum.
Kulinjana	Do.	Alpinia Galanga.
Sindaravani	Do.	Curcuma pseudomontana.
Chavara	Do.	„ caulina.
Mándá	Do.	Dioscorea triphylla.
Ulasi	Do. & flowers.	„ pentaphylla.
Márapáspoli	Do.	„ oppositifolia.
Kadu karanda	Do.	Helmia Dioscorea.
Zatar	Do.	Asparagus sarmentosus.

Vernacular name.	Part of Plant used.	Scientific name.
Rámabána...............	Pollen............	Typha elephantina.
Jangali Bajri	Seeds	,, latifolia.
Jangali surana.........	Tuber & leaf...	Amorphophallu scampanulatus.
Kachara	Do.	Scirpus Kysoor.
Thegi......................	Do.	Cyperus bulbosus.
Aghádá	Seeds	Achyranthes aspera.

NOTE.—Many of the plants mentioned in the above lists are more or less used at all times by different classes of natives, and when properly cooked and seasoned, are very palatable ; others are universally eaten at certain seasons, *e.g.*, Smithia sensitiva on the four Mondays of the month Shravan.

Remarks.

The most important and most generally used wild seeds during the late Deccan famine have been reported upon by Dr. W. Gray in an interesting paper read before the Bombay Medical and Physical Society in 1882. (See *Transactions* of the Society for that year.) The following is the result of an analysis of the seeds by Professor Lyon, of Bombay, as given in this paper :—

	Average cereal.	Average pulse.	Abutilon muticum.	Indigofera linifolia.	Indigofera cordifolia.	Indigofera glandulosa.	Sesbania ægyptiaca.	Phaseolus trilobus.	Cyanotis axillaris.
Water	11·62	10·00	4·00	5·09	5·28	8·91	10·50	5·38	10·26
Fat	3·00	3·50	6·60	3·94	5·83	...	4·85	2·93	0·62
Albuminates*	9·12	25·06	17·55	33·29	35·21	24·25	33·79	24·42	15·99
Carbo-hydrates	71·23	51·30	29·37	20·05	29·34	48·21	18·23	44·66	54·79
Cellulose	3·00	7·14	37·77	33·90	18·90	16·00	28·37	17·54	9·36
Ash	2·00	3·00	4·71	3·73	5·44	2·63	4·26	5·04	8·98
* Containing nitrogen (per cent.)	1·46	4·01	2·82	5·37	5·68	3·88	5·45	3·94	2·58
Nitrogen (grains per oz.) ...	6·38	17·86	12·33	23·49	24·85	16·97	23·84	17·33	11·28
Nutritive carbon (grains per oz.)	170·00	170·00	120·70	130·10	141·00	130·10	130·90	145·20	145·80
Percentage of nutritive value as compared with—									
Average cereal	100·00	......	71·01	...	...	...	...	...	85·76
Average pulse...	......	100·00	...	76·50	83·00	95·00	76·90	85·40	...

Dr. Gray justly remarks :—"The indiscriminate condemnation to which these seeds were subjected, for no better reason apparently than that they were wild, is much to be deprecated. Such ill-effects as did result from eating them were due, not to the 'wildness' of the seeds, nor, probably, to any deficiency in nutritive qualities, but to their having been improperly prepared and used. Should occasion again unhappily arise, obliging the poorer classes to resort to desultory modes of living, it is to be hoped that, with the experience now gained, the means which nature so abundantly provides for the preservation of life may be more intelligently appreciated."

APPENDIX D.

Note on the Chemical Composition of the leaves of Erythroxylon monogynum vel indicum. By L. A. Waddell, M.B., Offg. Professor of Chemistry, Calcutta Medical College.—Since the discovery, about a year ago, of the valuable properties possessed by cocaine and its hydrochlorate as effective and manageable local anæsthetics, extreme interest has been excited throughout the medical world in the coca plant—(*Erythroxylon Coca*)—the well-known masticatory of Peru—and its active principle cocaine. And as further experience of the use of the alkaloid has served to confirm the most sanguine expectations which were formed with regard to it when first its remarkable effects on the eye became known, the plant itself is undoubtedly destined to become a product of much commercial importance, and already its cultivation with this view is being actively prosecuted in Madras and Ceylon. In the botanic gardens of the latter country the coca plant has been growing since 1870, and thrives well.

As we have in India an indigenous species of the Erythroxylon genus, viz., *E. monogynum*, it becomes interesting to ascertain whether or not the local species contains an alkaloid identical with cocaine or possessed of similar properties. This inquiry was suggested to me about two months ago, on visiting the Calcutta Royal Botanic Gardens, when Dr. King, the able Superintendent, pointed out a healthy specimen of *E. monogynum* which had been growing in the the garden for many years past.

The leaves of *Erythroxylon monogynum* resemble closely those of the S. American species, *E. Coca*. They are described by Hooker,[*] as being "1-2 by ⅔-in., obovate or elliptic—or cuneate—obovate, tip rounded, hardly shining above, pale glaucous brown beneath when dry, nerves oblique, much reticulated, peduncles ¼—⅓ inches." The synonyms are *E. indicum* (Beddome) and *Sethia indica* (D. C.), and its vernacular names *Devadaru* and *Adivigoranta*. It is found in the dry hilly parts of Madras (Cuddapah) and in hot dry parts of the island of Ceylon. Subsequent to commencing the examination of the leaves of this plant, I ascertained that Dr. H. Trimen[†] and Dr. Bidie, C.I.E.,[‡] have lately expressed the opinion that the leaves of *E. monogynum* might possibly contain cocaine.

Through the kindness of Dr. King I was provided with an ample supply of the fresh leaves of *E. monogynum* gathered in the first week in July.

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[*] The Flora of British India, Vol. I, p. 414.

[†] In the Report of the Royal Botanic Garden in Ceylon for the year 1884.

[‡] In a pamphlet on "Coca, its Source, Culture, Uses," &c., published at Madras a few months ago.

My examination of the leaves was simply directed towards ascertaining whether or not the leaves contained any alkaloid of a cocaine-like character. I did not attempt the determination of the detailed composition of the leaves. The processes resorted to by me in the endeavour to extract an alkaloidal principle were those made use of and recommended by Niemann* and Lossen† for extracting cocaine from the leaves of *E. Coca.*

The leaves were gradually and thoroughly dried, as is recommended with regard to coca leaves, at first on a table in an airy room, and latterly in the sun. The dried leaves were more or less flat, slightly brittle, and of a yellowish green colour, and gave off *en masse* a somewhat fragrant odour. When chewed, the leaves were insipid and devoid of any positive taste or decided astringency.

One kilogramme of the dried leaves was reduced to a coarse powder and exhausted with strong rectified spirits containing one-fiftieth of sulphuric acid. The alcoholic solution was supersaturated with lime, then carefully neutralized with dilute sulphuric acid, the precipitated sulphate of lime removed, and the bulk of the alcohol driven off by evaporation on the water bath.

The residuary fluid was then supersaturated with soda, and shaken repeatedly with ether, and the ethereal solution removed and allowed to evaporate spontaneously. Only some semi-solid pale resinous material of a peculiar sickening odour was obtained in this way. Repeated solution (in ether and alcohol) and re-evaporation of this ethereal extract failed to obtain any body of an alkaloidal nature, nor could any salts, crystalline or otherwise, be obtained.

A second lot was treated according to Lossen's mode of extracting cocaine. Eight hundred grammes of the dried and coarsely powdered leaves were extracted with boiling water, then acetate of lead added, till no further precipitate fell. The excess of the lead remaining in solution was removed by sodium sulphate, the mixture filtered, and soda added to the filtrate in slight excess. On shaking this mixture with ether, and drawing off the ether and allowing it to evaporate, only a very small amount of colouring matter was left behind. No alkaloidal body was obtained, nor could any salts, crystalline or other, be obtained.

The result of these operations, it will be seen, is to show that no cocaine-like alkaloid is present in the leaves of *E. monogynum,* and indeed the presence of any alkaloid or glucoside at all is rendered unlikely, for most alkaloidal bodies would have been isolated by the processes here employed.* It is true that the individual shrub from which these leaves were taken was growing in a locality different from its natural habitat; but as the bush was in excellent condition, it is extremely unlikely that its slightly foreign location would be attended by an utter absence of any characteristic and normal active principle. The amount of material operated on was so large that the presence of a cocaine-like alkaloid in the most minute traces could not have escaped detection. And collateral evidence lends itself to the belief that the plant when growing in its native habitat is devoid of any very active properties; for it has been recorded by Dr. Bidie, that during the Madras famine the starving people in the Cuddapah district consumed, amongst the leaves and fruit of other available trees, large quantities of the leaves of *E. monogynum* without experiencing any remarkably restorative effects.—(From the *Indian Medical Gazette* for September 1884, p. 281.)

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* In the *Vierteljahresschr. für practische Pharmacie,* Vol. IX., p. 489. Munich 1860.

† *Ann. Chem. Pharm.,* 133, 352; 1862.

APPENDIX E.

Glossary of Marathi Names of Plants and Drugs.

अकडा	Blepharis asperrima, *Nees.*
अकरमाशी खरबूज	Cucumis Melo, *Linn.*, var.
अंकरी	Vicia hirsuta, *Koch.*
अकरोट, अकरोड; अक्रोट, अक्रोड; अखोड, अखरोड, अखरोट	Aleurites moluccana, *Willd.*
अक्कलकरा-कारा-काडा-काढा-काला-खार	Anacyclus Pyrethrum, *D. C.*
अक्लिल्उल्मलिक्	Melilotus hamosa, *Link.*
अंकोल, अकोला	Alangium Lamarckii, *Thwaites.*
अगर, अगरू	Aquilaria Agallocha, *Roxb.*
अगस्ती or स्त्या	Sesbania grandiflora, *Pers.*
आगिनथंबा थोरला	Salvia plebeia, *R. Br.*
आगिनथंबा धाकटा	Blumea sp.?
अचरबोंडी	Spilanthus Acmella, *Linn.*, var. oleracea, *Clarke.*
अजगंद	Ocimum Basilicum, *Linn.*, var.
अंजन,	Memecylon edule, *Roxb.*, Hardwickia binata, *Roxb.*
अजमोद	Carum Roxburghianum, *Benth.*
अजवला	Ocimum Basilicum, *Linn.*, var. pilosum.

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* "Hygrine," if present, would have remained in the soda solution.

अजवान, अज्वान	Carum copticum, *Benth.*
अजानवृक्ष	Ficus sp. ? The name of a tree at the temple of Alandi, said to have sprung from the planted staff of Dnaneshwar, declared to be unique.
अंजीर	Ficus Carica, *Linn.*
अंजेली	Artocarpus hirsuta, *Lamk.*
अझ्खीर	Andropogon laniger, *Desf.*
अटक्र	Flacourtia montana, *Grah.*
अटकी	Mæsa indica, *Wall.*
अडणमडण	Bryophyllum calycinum, *Salisb.*
अडवळ	A tree. Bot. name ?
अडुळसा	Adhatoda Vasica, *Nees.*
अडोम	Mimusops Kauki, *Linn.*
अतकी	Mæsa indica, *Wall.*
अतमटी	Bauhinia purpurea, *Linn.*
अंतरवेल	Cuscuta reflexa, *Roxb.* Cassytha filiformis, *Mill.*
अतिछत्रा	Peucedanum graveolens, *Benth.*
अतिबला	Sida rhombifolia, *Linn.*
अतिमुक्ता	Hiptage Madablota, *Gärt.*
अतिवीष	Aconitum heterophyllum, *Wall.*
अत्रून	Flacourtia sepiaria, *Roxb.*
अनंत	Gardenia florida, *Roxb.*
अनंततगर	Tabernæmontana coronaria, *Br.*
अनंता	Hemidesmus indicus, *R. Br.*
अननस	Ananassa sativa, *Linn.*
अनवल or अनर	Anona reticulata, *Linn,*
अनार	Punica Granatum, *Linn.*
अनीसून	Pimpinella Anisum, *Linn.*
अपकरा	?
अपटा	Bauhinia racemosa, *Lam.*
अफ्तीमून	Cuscuta sp ? from Persia.
अफ्संतीन	Artemisia sp ? from Persia.
अबई	Reinwardtia trigyna, *Planch.*
अंबट or टी	Embelia robusta, *Roxb.*
अंबटनिंबू	Citrus medica, *Linn.* var. 3, acida. The sour lime.
अंबटवेल	?

अबनूस्	Diospyros sp. var. Ebony.
अंबर, अंबरवेल	Tinospora cordifolia, *Miers.*
अंबरकंद	Eulophia bicolor. *Dalz.*
अंबरबारीस	Berberis Lycium, *Royle.* The dried fruit.
अबूहल	Juniperus communis, *Linn.* The berries imported.
अंबा or आंबा	Mangifera indica, *Linn.*.
अंबाडा or अंबाडी	Hibiscus cannabinus, *Linn.*, H. Subdariffa, *Linn.*, Spondias mangifera, *Pers.*
अंबाडी	Crotalaria juncea, *Linn.*
अंबुचीचिंबोची	A vegetable. Bot. name?
अंबुटी	Oxalis corniculata, *Linn.*
अंबुरकी चिंच	Tamarindus indica, *Linn.* The ripe fruit.
अंबेमोहर	Oryza sativa, *Linn.*, var.
अंबेरी	Nothopegia Colebrookiana, *Blume.*
अंबेहळद	Curcuma aromatica, *Salisb.*
अबोली	Justicia infundibuliformis, *Willd.*
अंबोशी	Mangifera indica, *Linn.* The dried unripe fruit.
अम्भल्	Juniperus communis, *Linn.* The dry berries.
अमटी	Embelia robusta, *Roxb.*
अमडा	Spondias mangifera, *Pers.*
अमरकंद	Eulophia bicolor.
अमरवेल	Tinospora cordifolia, *Miers.*
अमली	Bauhinia malabarica, *Roxb.*
अमाडा	Curcuma Amada, *Roxb.*
अमृता	Tinospora cordifolia, *Miers.*
अय्यापाना	Eupatorium Ayapana, *Vent.*
अरकर	Mimosa hamata, *Willd.*
अरचिरी	Olax scandens, *Roxb.*
अराणि	Premna integrifolia, *Linn.*
अरणी	Clerodendron inerme, *Gärt.*
अरसल	Plectronia didyma, *Hook f.*
अराई	Mimosa rubricaulis, *Linn.*
अर्जुन	Terminalia Arjuna, *Bedd.*
अर्धीसुपारी	Caryota urens, *Linn.* The fruit.
अलई	Dalbergia volubilis, *Roxb.*

अलमिरो	Launæa pinnatifida, *Cass.*
अलिता	Cactus indicus, ***Roxb.***
अलें	Zinziber officinale, ***Roxb.***
अलोंबे	Agaricus campestris, ***Linn.***
अवकीर	?
अवळ	Phyllanthus Emblica, ***Linn.***
अवळी	
अशोक	Saraca indica, ***Linn.***
अश्मंतक	Bauhinia tomentosa, ***Linn.***
अश्वकातरी	Polypodium quercifolium, ***Spr.***
अश्वगंधा	Withania somnifera, ***Dunal.***
अश्वत्थ	Ficus religiosa, ***Linn.***
अष्ट	Ficus cordifolia, ***Roxb.***
असण	Terminalia tomentosa, *W. & A.*
असालिया	Lepidium sativum, ***Linn.***
असेती	Morinda tinctoria, ***Roxb.***, var. tomentosa.
असोक	Saraca indica, ***Linn.***
अस्कंद	Ipomœa digitata, ***Linn.*** The young tubers.
अहळीव	Lepidium sativum, ***Linn.***
अहिरावणमहिरावण	Bryophyllum calycinum, ***Salisb.***
अळंबी	Agaricus campestris, ***Linn.***, and other mushrooms.
अळवीण	Colocasia antiquorum, ***Schott.***
अळशी	Linum usitatissimum, ***Linn.***
अळसुंदा	A creeping plant bearing a pod, also the pod. Bot. name?
अळू	Colocasia antiquorum, *Schott.*
अक्षतेचें खोड	The roots of Diospyros Embryopteris, *Pers.*
आईन	Terminalia tomentosa, *W. & A.*
आऊल	Morinda citrifolia, ***Linn.***
आकाशमूली	Cuscuta reflexa, ***Roxb.*** Cassytha filiformis, *Mill.*
आकाशवेल or वल्ली	
आकी	Blighia sapida, *Don.*
आकोल	Alangium Lamarckii, ***Thwaites.***
आखुकर्णी	Ipomœa reniformis, ***Chois.***
आगडा or अघाडा or आघाडा	Achyranthes aspera, ***Linn.***

आग्या or आगिनबुटी	Ammania baccifera, *Linn.*
आजवला	Ocimum sanctum, *Linn.*
आटकी	Mæsa indica, *Wall.*
आटवी	Flüggea virosa, *Dalz.*
आटीक	A tree. Bot name ?
आंडबैल	?
आनकुल	Alangium Lamarckii, *Thwaites.*
आपटा or अभिता	Bauhinia racemosa, *Lam.*
आंबटी	Oxalis corniculata, *Linn.*
आंबण	A tree. Bot. name ?
आबू	Vangueria edulis, *Vahl.*
आंबेहळद	Curcuma aromatica, *Salisb.*
आंबोती	Oxalis corniculata, *Linn.*
आबोली	Justicia infundibuliformis, *Willd.*
आमगुळा	?
आमटी	Ipomæa sepiaria, *Kœn.*
आमण	?
आमलक—की	Phyllanthus Emblica, *Linn.*
आल or आलें	Morinda citrifolia, *Linn.*
आलूबोखारा	Prunus communis, *Huds.* var., insititia.
आंवळकठी	Phyllanthus Emblica, *Linn.* The dry fruit.
आष्ट or आस	Thespesia populnea, *Corr.*
आसवेल	Asparagus racemosus, *Willd.*
आस्गंध	Withania somnifera, *Dunal.* Ipomœa digitata, *Linn.* The young tubers.
आस्वल	?
आळशी or सी	Linum usitatissimum, *Linn.*
आळू	Colocasia antiquorum, *Schott.*
इंगळी	?
इचका	Tradescantia axillaris, *Linn.*
इंद्रकापशी	Gossypium herbaceum, *Linn.*, var.
इंद्रजव	Holarrhena antidysenterica, *Wall.* The seeds. Also Wrightia tinctoria, *Br.* The seeds.
इंद्रजोत	Holarrhena antidysenterica, *Wall.*
इंद्रफळ or इंद्रवारुणी	Citrullus Colocynthis, *Schrad.*
इंद्राणी	Vitex Negundo, *Linn.*
इंद्रायण	Citrullus colocynthis, *Schrad.*

इस्फी	Holcus saccharatus.
इरण	Clerodendron phlomoides, *Linn.*
इलाची or इलायची	Elettaria Cardamomum, *Maton.*
इसस	Frankincense from Boswellia floribunda, *Endl.*
इस्पंगूल्	Plantago Ispaghula, *Roxb.*
इस्पंद	Peganum Harmala, *Linn.*
इक्षु	Saccharum officinarum, *Linn.*
ईसबगोळ	Plantago Ispaghula, *Roxb.*
उकशी	Getonia floribunda, *Roxb.*
उखामंडळ	Borassus dichotomus, *White.*
उझोमूठ	Synantherias sylvatica, *Schott.*
उंडल or ळ	Calophyllum inophyllum, *Linn.*
उंडी or उंडीण	
उडीद	Phaseolus Mungo, *Linn.*, var. radiatus, *Linn.*
उतंगण	Blepharis edulis, *Pers.*
उतरण	Dæmia extensa, *R. Br.*
उदीचित्रक	Plumbago capensis, *Spr.*
उदीचिरायत	Exacum bicolor, *Roxb.*
उंदीरकानी	Ipomœa reniformis, *Chois.*, and Lactuca remotifolia, *D. C.*
उंद्री	Linum mysorense, *Heyne.*
उदुंबर or उंबर	Ficus glomerata, *Roxb.*
उदेबलेसान	Balsamodendron Opobalsamum, *Kunth.* The wood.
उदेसालब	Pæonia Emodi, *Wall.*
उधाबांस	Bambusa stricta, *Roxb.*
उन्नाब्	Zizyphus vulgaris, *Lamk.*
उन्हाळी	Tephrosia purpurea, *Pers.*
उपरसाळ or उपलसरी	Hemidesmus indicus, *R. Br.*
उपळी	Nymphæa Lotus, *Linn.*
उंब	Nephelium Longana, *Camb.*
उंबळी	Gnetum scandens, *Roxb.*
उरसूल	Canthium umbellatum, *Wight.*
उरो	Excæcaria insignis, *Müll. Arg.*
उलतकंबल	Abroma augusta, *Linn.*
उशक्	Dorema Ammoniacum, *Don.*
उक्षी	Getonia floribunda, *Roxb.*

ऊटकटारा	Tricholepis montana, *Dalz.*
ऊतिङ्गन	Blepharis edulis, *Pers*
ऊद	Styrax Benzoin, *Dryand.* The gum.
ऊदुल	Albizzia stipulata, *Boivin.*
ऊलसी	Dioscorea pentaphylla, *Willd.*
ऊस or ऊंस	Saccharum officinarum, *Linn.*
ऊसधन	Andropogon Nardus, *Linn.*
ऊस्तखुदूस	Lavandula Stæchas, *Linn.*
ऊस्ना	Parmelia kamtschadalis, *Esch.*
ऊळ	Allium Cepa, *Linn.*
एकशेंगकापशी	Gossypium barbadense, *Linn.*, var. religiosum, *Roxb.*
एकळी	A shrub. Bot. name?
एरंड or एरंडी	Ricinus communis, *Linn.*
एरवणा	?
एरीबाभूळ	Acacia arabica, *Willd*, var. with broad pods.
एलची	Elettaria Cardamomum, *Maton.*
एने	Terminalia tomentosa, *W. & A.*
ऐनसादडा	Ulmus integrifolia, *Roxb.*
ऐरण	Clerodendron phlomoides, *Linn.*
ऐरावणमैरावण	Bryophyllum calycinum, *Salisb.*
ऐसर	Callicarpa cana, *Linn.*
ओंऊळ	Mimusops Elengi, *Linn.*
ओंट or ओंष्ट	Garcinia xanthochymus, *Hook. f.*
ओंड	Artocarpus Lakoocha, *Roxb.*
ओंडी	Vitis carnosa, *Wall.*
ओंब	Nephelium Longana, *Camb.*
ओलतकंबोल	Abroma augusta, *Linn.*
ओलाचाहा	Andropogon citratus, *D. C.*
ओलेंकिराईत	Andrographis paniculata, *Nees.*
ओवा	Carum copticum, *Benth.*
ओंवापानाचा	Coleus aromaticus, *Benth.*
ओसग or गी	Saraca indica, *Linn.*
ओसबनेती	?
ओसाडी	Ageratum conyzoides, *Linn.*
औदुंबर	Ficus glomerata, *Roxb.*
कंकोळ	Piper Cubeba, *Linn. f.* The fruit.
कंगरा	Saccharum spontaneum, *Linn.*

कंचन	Bauhinia variegata, *Linn.*
कचर or कचरा	Scirpus Kysoor, *Roxb.*
कचोरा or री or कचोला	Curcuma Zedoaria, *Roscoe* (non *Roxb.*)
कझूरती	Hippocratea indica, *Willd.*
कटकूरा	Ixora nigricans, *Br.*
कटुतुंबी	Lagenaria vulgaris, *Seringe.* Bitter var.
कडवई or कडवी	Phaseolus Mungo, *Linn.*, var. radiatus, *Linn.*
कडवंची	Momordica Cymbalaria, *Fenzl.*
कडवा	Hymenodictyon excelsum, *Wall.*
कडवाकरांदा	Dioscorea bulbifera, *Linn.*
कडवी	Anamirta Cocculus, *W. & A.* The fruit is कडवावाल.
कडवीकवठ	Hydnocarpus Wightianum, *Bl.*
कडवीनाई	Swertia sp. var. also Corallocarpus epigæa, *Hook. f.*, and Enicostema littorale, *Blume.*
कडवीवाघांटी or कडवी वागेटी	Paramignya monophylla, *Wight.*
कडसंबळ	Canavalia virosa, *W. & A.*
कडिकपान	Polypodium quercifolium, *Spr.*
कडुइंद्रायण	Citrullus Colocynthis, *Schrad.*
कडुखजूर	Melia dubia, *Cav.* The fruit.
कडुघोसाळी	Luffa acutangula, *Roxb.*, var. amara, *Roxb.*
कडुजिरें	Vernonia anthelmintica, *Willd.*
कडूइंद्रजव	Holarrhena antidysenterica, *Wall.*
कडूकरंडा	Dioscorea bulbifera, *Linn.*
कडूकरंदा or करांदा	
कडूकवठ	Hydnocarpus Wightianum, *Bl.*
कडूकारळी	Guizotia abyssinica, *Cass.*
कडूचिंच	Corchorus trilocularis, *Linn.*
कडूतोंडली	Cephalandra indica, *Naud.* The wild plant.
कडूदोडकी or कें	Luffa acutangula, *Roxb.*, var. amara, *Roxb.*
कडूनिंब	Melia Azadirachta, *Linn.*
कडूपडवळ	Trichosanthes cucumerina, *Linn.* T. dioica, *Roxb.*, in Guzerat.
कडूबदाम	Prunus amygdalus, *Baillon.*, var. amara.

कडूभोपळीं	Lagenaria vulgaris, *Seringe.*
कडूवृंदावन	Citrullus Colocynthis, *Schrad.*
कडूसुरिंजान	Bitter Hermodactyl.
कडोजी	An umbelliferous plant. Bot. name ?
कढ्या	?
कढीनिंब	Melia Azadirachta, *Linn.*
कणगर or कणगी	Dioscorea aculeata, *Roxb.*
कणवेल	Ceropegia juncea, *Roxb.*
कणेर or री or कण्हेर	Nerium odorum, *Solan.*
कणेरीकेळ	Musa paradisiaca, *Linn.* var.
कतक	Strychnos potatorum, *Linn.*
कथल्या	Cochlospermum, Gossypium, *DC.*
कथली	Panicum frumentaceum *Roxb.*
कदंब	Anthocephalus Cadamba, *Benth.*
कदली	Musa paradisiaca, *Linn.*
कंदोद्भवा गुळवेल	Tinospora cordifolia, *Miers.*
कनगलु	Dillenia pentagyna, *Roxb.*
कनोछा	Phyllanthus madraspatensis, *Linn.*
कापिला कपीता or कपीला or कमीला	Mallotus philippinensis, *Müll.*
कफेमरीयाम्	Anastatica Hierochuntina, *Linn.*
कबर	Capparis spinosa, *Linn.* The bark, from Persia.
कंबळ	Hymenodictyon excelsum, *Wall.*
कबाबचिनी	Piper Cubeba, *Linn. f.*
कमटिआ	Acacia Suma, *Kurz.*
कमळ	Nymphæa Lotus, *Linn.*, Nelumbium speciosum, *Willd.*
कमळकांकडी	Nelumbium speciosum, *Willd.* The seeds.
करकनी	Leea sambucina, *Willd.*
करज or करंज	Pongamia glabra, *Vent.*
करंटुली or करंटोली or कटोंली	Momordica dioica, *Roxb.*
करडआडुळसा	Justicia picta, *Roxb.*
करडई or करडी	Carthamus tinctorius, *Linn.* The seeds.
करंडी	Abutilon indicum, G. *Don.* A. muticum, G. *Don.*
करणफळ	Clausena heptaphylla, *W. & A.*
करणी	Mimusops hexandra, *Roxb.*
करंद	Carissa Carandas, *Linn.*

करदळ or ळी	Ancistrocladus Heyneanus, *Wall.*
करंदा or कारंदा	Carissa Carandas, *Linn.*
करदोंडो	?
करप्स	Apium graveolens, *Linn.*
करंबल or कर्मरंग or करंबेळ or करमर or खमरक or रकमल or करमळ or करंबळ.	Averrhoa Carambola, *Linn.*
करंबू	Olea dioica, *Roxb.*
करंवजें	?
करवट or करवती	Ficus asperrima, *Roxb.*
करवंद or दी	Carissa Carandas, *Linn.*
करवीर	Nerium odorum, *Solan.*
करा	Strobilanthus callosus, *N. ab E.*
कराणा	A vegetable. Bot. name ?
करांदा or करमई	Dioscorea bulbifera, *Linn.* Carissa Carandas, *Linn.*
करील or केरा	Capparis aphylla, *Roth.*
करेरा	Streblus asper, *Lour.*
करै	Sterculia urens, *Roxb.* Casearia tomentosa, *Roxb.*
करोंझा	Carum Roxburghianum, *Benth.*
कर्कटशृंगी	Pistacia integerrima, *Stewart.*
कर्कटी	?
कर्करीवेल	?
कर्कुंडी	Jatropha nana, *Dalz.*
कर्कोटकी or कर्कोटी	Momordica dioica, *Roxb.*
कर्चूर	Curcuma Zedoaria, *Roscoe,* (non *Roxb.*)
कर्डई or कुसुंभ	Carthamus tinctorius, *Linn.* The seeds.
कर्दळी	Canna indica, *Linn.*
कर्प	Hemigyrosa canescens, *Thwaites.*
कर्पूरवल्ली	Anisochilus carnosus, *Wall.*
कऱ्हाट	Cucumis trigonus, *Roxb.*
कालिंगड ro कलिंगण	Citrullus vulgaris, *Schrad.* Gardenia latifolia, *Ait.*
कलुमकाचरी	Jateorrhiza palmata, *Miers.* The sliced root.
कवच	Mucuna pruriens, *D. C.*
कवठ or कंवठ or कवठ or कविठ or कवंठी.	Feronia elephantum, *Corr.* Achras Sapota, *Roxb.*

केंवडळ	Trichosanthes palmata, *Roxb.*
कवदर	Musa ornata, *Roxb.*
कवला	Smithia sensitiva, *Ait.*
कवाता	A young Cocoanut plant. Cocos nucifera, *Linn.*
काश्मिरीबनफ्सा	Viola odorata, *Linn.*
कस or कस्सो	Elæocarpus oblongus, *Gært.*
कसईबीज	Coix lacryma, *Linn.* The seeds.
कासिली	Abutilon muticum, *G. Don.*
कसूस	Cuscuta sp., from Persia.
कस्तुरभेंड or डी	Hibiscus Abelmoschus, *Linn.*
कस्सोद	Cassia siamea, *Lam.*
कळक	Bambusa vulgaris, *Wendl.*
कळक्याऊस	Saccharum officinarum, *Linn.* var.
कळंब	Anthocephalus Cadamba, *Bth.* and *Hook f.*
कळलावी	Gloriosa superba, *Linn.*
कळसुंद	Barleria prionitis, *Linn.*
काकई	Flacourtia Ramontchi, *L'Herit.*
काकगंगा	Desmodium triquetrum, *D. C.*
काकजंघा	Leea hirta, *Roxb.*
कांकड or कुडक	Garuga pinnata. *Roxb.*
कांकडशिंगी	Pistacia integerrima, *Stewart.*
कांकडी काकडी or खिरा काकडी or कांकडी or कर्कटी.	Cucumis sativus, *Linn.*, and loosely applied to Cucumis Melo, *Linn*, var. utilissimus, *Roxb.*, properly तवसी.
काकतुंडी or कुडकी	Asclepias currassavica, *Linn.*
काकनज्	Withania coagulans, *Dunal*, and Physalis Alkekengi, *Willd.*
काकफळी काकमारी	Anamirta Cocculus, *W. & A.*
काकी or कांकी	?
कांकोली	?
कांगणा	Solanum nigrum, *Linn.*
कांगणी or कांगुणी or कांगोणी or कंगु	Celastrus paniculatus, *Willd.*
कागदीएलची	Elettaria Cardamomum, *Maton.*
कांगसदृशवनस्पति	?
काचकुयरी	Mucuna pruriens, *DC.*
कांचन	Bauhinia variegata, *Linn,*

कांचरी	Alternanthera sessilis, *R. Br.*
काजरवेल	Strychnos colubrina, *Linn.*
काजरा	Strychnos Nux-vomica, *Linn.*
काजरी	?
काजऱ्याचें बाशिंग	Polypodium quercifolium, *Spr.*
काजवीण or काजू	Anacardium occidentale, *Linn.*
काजळ or ळी	Tradescantia axillaris, *Linn.*
काज्ला	Ægiceras corniculata, *Blanco.*
काझुरी	Oldenlandia dichotoma, *Koen.*
काटमोगरी	Jasminum Sambac, *Aiton.*, var.
कांटला or कांटली or कांटवेल	A creeper, Bot. name ?
कांटेआंवळा	Phyllanthus distichus, *Müll.-Arg.*
कांटेकणंग or कांटेकांगी	Dioscorea aculeata, *Roxb.*
कांटेकुयरी	Mucuna pruriens, *D.C.*
कांटेकुंवळा or कांटेकूमळ	Sapota tomentosa, *D.C.*
कांटेधोतरा	Datura fastuosa, *Linn.*, var. flava.
कांटेपुवण	Phyllanthus virosus, *Willd.*
कांटेभाजी or कांटेमाठ	Amarantus spinosus, *Willd.*
कांटेभोंवरी	Ichnocarpus frutescens, *Don.*
कांटेमाका	Blepharis molluginifolia, *Juss.*
कांटेरा	A thorny plant with white flowers. Bot. name ?
कांटेरिंगणी	Solanum zanthocarpum, *Schrad.*
कांटेरीइंद्रायण	Ecballium Elaterium, *A. Rich.*
कांटेशेवती	Rosa glandulifera, *Roxb.*
कांठभोंवरी	Ichnocarpus frutescens, *Don.*
कांडकुसुंबा	A wild vegetable. Bot. name ?
कांडवेल	Vitis quadrangularis, *Wall.*
कांडूळ	Sterculia urens, *Roxb.*
कातरवेल or कात्रीवेल	?
कात्रीनिगुड (निर्गुडी)	Vitex trifolia, *Linn.*
काथमांडा	?
कांदा	Allium Cepa, *Linn.*, and other bulbous plants.
कानफुटी or कानफोडी	Cleome viscosa, *Linn.*, and Gynandropsis pentaphylla, *DC.*
कापशी or कापांस	Gossypium herbaceum, *Linn.*
कापुर्ली	Anisochilus carnosus, *Wall.*
कापूरकरदळी	?

कापूरचिनी	Myrtus Pimenta, *Linn.* The fruit, Allspice.
कापूरभेंडी	Naregamia alata, *W. & A.*
कापूरवेल	Piper Betle, *Linn.*, var. also a flowering creeper. Bot. name?
कापुराचेंझाड	Blumea sp.?
काप्सी	Conocephallus niveus, *Wight.*
काक्रीतवसें	Kigelia pinnata.
कामणी or कामोणी or काकमाची	Solanum nigrum, *Linn.*
कामराज	?
कामुनी	Solanum nigrum, *Linn.*
कायफळ	Myrica sapida, *Wall.* Myristica malabarica, *Lamk.* The fruit.
कारय	Sterculia urens, *Roxb.*
कारली or कारवेल्ल	Momordica Charantia, *Linn.*
कारव or कारवी or कार्वी	Strobilanthus callosus, *N. ab E.*
कारवन	Cratæva religiosa, *Forst.*
कारळातीळ	Guizotia abyssinica, *Cass.*
कारळ्यें	Vernonia anthelmintica, *Willd.*
कारिंट or कारीट	Cucumis trigonus, *Roxb.*
कारिवणा or ना	Hydrocotyle asiatica, *Linn.*
कारेती or कारलें	Momordica Charantia, *Linn.*
कार्पास	Gossypium herbaceum, *Linn.*
कालगोरी	Stereospermum suaveolens, *D.C.*
कालादाना	Ipomœa hederacea, *Jacq.*, and Ipomœa muricata, *Jacq.*
कांवडळ	Trichosanthes palmata, *Roxb.*
कावती	A small Betlenut plant, Areca Catechu, *Linn.*
कावदोडी	Bryonia laciniosa, *Linn.*
कावरूख	?
कावळी	Gymnema sylvestre, *R. Br.*
कावळीचें ढोल	Bryonia laciniosa, *Linn.*
कावा	Coffea arabica, *Linn.*
काश	Saccharum spontaneum, *Linn.*
काशिंदा	?
कासंदा or कासुंदा or कासोंदा	Barleria prionitis, *Linn.*
कासूनी	Cichorium Intybus, *Linn.*
कासली	Abutilon indicum, *G. Don.*, and A. muticum, *G. Don.*

कांसाळवत or कांसाळूं	Colocasia antiquorum, *Schott.*
कासुस	Cuscuta sp ? from Persia.
काहू	Lactuca scariola, *Linn.*, var. sativa.
काळाअकोला	Alangium Lamarckii, *Thwaites.*
काळाअडुळसा	Gendarussa vulgaris, *Nees.* Justicia picta, *Roxb.*, var. Nigricans.
काळाउंबर	Ficus hispida, *Linn. f.*
काळाकडू	Hymenodictyon excelsum, *Wall.*
काळाकुडा	Wrightia tinctoria, *Br.*
काळाखजूर or कडवाखजूर	Melia dubia, *Cav.* The fruit.
काळागुरा	Premna Nimmoniana, *Gibs.*
काळागोंडा	Olax Wightiana, *Wall.*
काळाचंपा or काळाचांपा	Michelia Champaca, *Linn.*
काळाचित्रक	Plumbago capensis, *Spr.*
काळातीळ	Guizotia abyssinica, *Cass.*
काळाधोतरा	Datura fastuosa, *Linn.*, purple var.
काळानागकेशर	Cinnamomum Cassia, *Blume,* and C. iners, *Reinw.* The fruit.
काळाबिचवा	A fern. Bot. name ?
काळावाळा	Pavonia odorata, *Willd.*
काळाशेगवा	Moringa pterygosperma, *Gært.* Bitter var.
काळीकांगनी	Setaria italica, *Beauv.*
काळीकांसाळवत	Colocasia antiquorum, *Schott.*
काळीकुटकी	Picrorhiza Kurroa, *Royle.*
काळीकुडई	Hymenodictyon excelsum, *Wall.*
काळीजिरी or काळेंजिरें	Vernonia anthelmintica, *Willd.* Nigella sativa, *Linn.*, var indica.
काळीतुळस	Ocimum sanctum, *Linn.*
काळीतेरी	Colocasia antiquorum, *Schott.* Black var.
काळीपानवेल	Piper Betle, *Linn.* The uncultivated var.
काळीभोपळी	Benincasa cerifera, *Savi.* Dark green var.
काळीमिरी	Piper nigrum, *Linn.*
काळीमुसळी	Hypoxis orchioides and uncifolia.
काळीवसू	Boerhaavia diffusa, *Linn.* Red var.
काळीवेल	Vitis auriculata, *Roxb.*
काळीशिरस्	Brassica campestris, *Linn.* Black Rape.
काळीहळद	Curcuma cæsia, *Roxb.*
काळेंकमळ	Nymphœa lotus, *Linn.*

काळेंजिरें or कलौंजी	Nigella sativa, *Linn.*, var. indica.
काळेंझाड	Tetranthera monopetala, *Roxb.*
काळेदाणे	Ipomœa hederacea, *Jacq.*
काळेमूग or उडीद	Phaseolus Mungo, *Linn.*
किंकर or कंकर	Acacia arabica, *Willd.* var.
किंकिणी	Salvadora persica, *Garcin,* and S. oleoides, *Dcne.*
किंगीन or कुंजीर	Cynara scolymus, *Willd.*
किंजळ or किंजुरा	Terminalia paniculata, *W. & A.*
किडामार	Aristolochia bracteata, *Retz.*
किणी	Achyranthes aspera, *Linn.*
किनइ	Albizzia procera, *Benth.*
किनळी	?
किन्ह्या	An umbelliferous plant, Bot. name ?
किरमाणीओवा	Artemisia maritima, *Linn.*
किरमिजीअज्वान	Seseli indicum, *W. & A.*
किरमिर	Glycosmis pentaphylla, *Corr.*
किरमुवा	?
किराईत	Andrographis paniculata, *Necs.*
कीमजी	Acacia sp. ?
कीरणी	Canthium parviflorum, *Lam.*
कीरद	Excæcaria baccata, *Müll.*
कीकुंडी	Jatropha nana, *Dalz.*
कीर्दमाना	Conium maculatum, L*inn.*
कुइरी or ली	Mucuna pruriens, *D. C.*
कुकडवेल	Luffa echinata, *Roxb.*
कुकर	Sterculia guttata, *Roxb.*
कुंकुमकेशर	Poinciana regia, *Bojer.*
कुचल	Strychnos Nux-vomica, *Linn.*
कुटकी	Celsia coromandeliana, *Vahl.*, and Picrorhiza Kurroa, *Royle.*
कुंटी	Murraya exotica, *W. & A.*
कुडक	Cedrela Toona, *Roxb.*
कुडा	Holarrhena antidysenterica, *Wall.*
कुडाळी	Phrynium capitatum, *Willd.*
कुणक	Bignonia undulata, *Roxb.*, also B. stans, *Willd.*
कुतरी or कुत्री	Oxalis corniculata, *Linn.*
कुऱ्याचें झाड	Solanum giganteum, *Jacq.*

कुंद	Jasminium arborescens, *Roxb.*
कुंदा	A kind of grass, Bot. name ?
कुद्रू or कुंद्रू	Celosia argentea, *Moq.*
कुनकू	Bignonia undulata, *Roxb.*, also B. stans *Willd.*
कुपी	Acalypha indica, *Linn.*
कुंबया	Lagerstræmia lanceolata, *Bedd.*
कुंबळ	Sapota tomentosa, *DC.*
कुंबा	Careya arborea, *Roxb.*
कुंभराज	?
कुंभार or कुंभी	Careya arborea, *Roxb.*
कुमुद	Nelumbium speciosum, *Willd.*
कुयली	Mucuna pruriens, *DC.*
कुरकी	Asclepias curassavica, *Linn.*
कुरतुडा	?
कुरफेंद्रा	Gardenia turgida, *Roxb.*
कुरा	Holarrhena antidysenterica, *Wall.*
कुराक	Garuga pinnata *Roxb.*
कुडू	Celosia argentea, *Moq.*
कुलई	Crotalaria Notonii, *W. & A.*
कुलती	Tragia involucrata, *Müll.-Arg.*
कुलिंजन	Alpinia Galanga, *Swz.*, A. nutans, *Rosc.* A. officinarum, *Hance.*
कुलिवेल	Anodendron paniculatum, *A. DC.*
कुली	Chlorophytum parviflorum, *Dalz.*
कुवरा or री	Artocarpus integrifolia, *Linn.* The young fruit.
कुंवळा	Sapota tomentosa, *DC.*
कुंवारकांडें or कुंवारफोड or कोरकंड or कोरफड or कुंवारी or कुमारी or कुवार	Aloe vera, *Linn.*, and other species of Aloe.
कुशा	Poa cynosuroides, *Linn.*
कुष्ट or कूट	Saussurea Lappa, *C. B. Clarke.*
कुसर or री	Jasminium latifolium, *Roxb.*
कुसुंबा	Carthamus tinctorius, *Linn.*
कुहिली	Mucuna pruriens, *DC.*
कुळिथ	Dolichos biflorus, *Linn.*
कूत्री	Solanum giganteum, *Jacq.*
कूरत	Ixora parviflora, *Vahl.*

कूल्फा	Portulaca oleracea, *Linn.*
कृष्णतुळस	Ocimum sanctum, *Linn.*
कृष्णधत्तूर	Datura fastuosa, *Linn.*
कृष्णागर	Aquilaria Agallocha, *Roxb.*
कृष्णशारिवा or कृष्णवल्ली	Ichnocarpus frutescens, *Br.*
केकत-ती or केतक-की or केतकट or केगद or केवडा-डी.	Pandanus odoratissimus, *Linn.*
केंजळ	Terminalia paniculata, *W. & A.*
केनी	Commelina communis, *Linn.*
केर्णी	Mimusops hexandra, *Roxb.*
केर्प	Saccharum spontaneum, *Linn.*
केवण or न	Helicteres Isora, *Linn.*
केशर	Crocus sativus, *Linn.*
केसरबोंडी or केसरी	Bixa Orellana, *Linn.*
केळ	Musa paradisiaca, *Linn.*
केळांबा	Mangifera indica, *Linn.* The long variety.
कैरची कोकंब or बी or कोकम	Garcinia indica, *Choiss.*
कोकरवेल	Piper trioicum, *Roxb.*
कोंगी	Ipomœa Batatas, *Lamk.*
कोंच or चें	A prickly creeping plant; it grows on the जांभ्या stone.
कोचरीक	?
कोंचिंदा	Urginea indica, *Kunth.*
कोडरसी	Securinega obovata, *Müll.-Arg.*
कोंडळ	Trichosanthes palmata, *Roxb.*
कोथमीर or कोथिंबरी or कोथिंबीर.	Coriandrum sativum, *Linn.*
कोथिर	?
कोथेर or रें	?
कोनफळ	Dioscorea sativa, *Willd.*
कोबी	Brassica oleracea, *Linn.*
कोयतेमोडा	A tree. Bot name?
कोरकंड	Aloe vera, *Linn.*
कोरल or कोरळ	Bauhinia malabarica, *Roxb.*
कोराटा	Hygrophylla spinosa, *T. And.*
कोराटा काळा or निळा	Barleria strigosa, *Willd.*
कोद्रु	Paspalum scrobiculatum, *Linn.*
कोऱ्हांटी	Barleria prionitis, *Linn.*

कोलकांदा	Urginea indica, *Kunth.*
कोलंद	Pastinaca glauca, *Dalz.*
कोलस्विंदर	Setaria glauca, *Beauv.*
कोलार	?
कोलिस्ता or कोळिता	Barleria prionitis, *Linn.*
कोलेंझान	Vitis adnata, *Wall.*
कोलेती	Tragia involucrata, *Müll.-Arg.*
कोऱ्हाळी	Benincasa cerifera, *Savi.*
कोशिंदा	Urginea indica, *Kunth.*
कोशिंब	Schleichera trijuga, *Willd.*
कोष्ट	Costus speciosus, *Sm.*
कोष्टकोळिंजण	Alpinia Galanga, *Swz.*, and A. nutans, *Rosc.*
कोसंब or कोसिंब	Schleichera trijuga, *Willd.*
कोहोळा	Benincasa cerifera, *Savi.*
कोळशी	?
कोळसुंदा	Hygrophylla spinosa, *T. And.*
कोळिस्ता	Barleria prionitis, *Linn.*
कौंडल	Trichosanthes palmata, *Roxb.*
कौदीर	Musa ornata, *Roxb.*
कौंस	?
कौळी	Gymnema sylvestre, *R. Br.*
खजुरी or खारीक	Phœnix dactylifera, *Linn.*, and P. sylvestris, *Roxb.*
खटखटी	Grewia pilosa, *Lam.*
खटांबा	Spondias mangifera, *Pers.*
खट्टाअनार	Punica Granatum, *Linn.* The sour kind.
खडकशेपू	Sphæranthus indicus, *Linn.*
खडपा	Portulaca oleracea, *Linn.*
खडशिंग or खडशेरणी	Bignonia xylocarpa, *Roxb.*
खडसबळ or ळी	Canavalia ensiformis, *D. C.*
खड्यानाग	Gloriosa superba, *Linn.*
खदिर	Acacia Catechu, *Willd.*
खप्परकडू	Ceropegia bulbosa, *Roxb.*
खपलेगहूं	Triticum sativum, *Lam.* A beardless var. grown on irrigated land.
खबाझी	Malva sylvestris, *Linn.* The imported seeds are sold under this name.

खंबारी	Costus speciosus, *Sm.*
खयर or खैर	Acacia Catechu, *Willd.*
खरगोळ	Procris ramiflora, *Lam.*
खरघोंस	?
खरघोळी	?
खरदल	Ancistrocladus Heyneanus, *Wall.*
खरंबटी	?
खरबुजी	Cucumis Melo, *Linn.*
खरबुटी	Vitis quadrangularis, *Wall.*
खरमंजरी	Achyranthes aspera, *Linn.*
खरमटी or खरमाटी	Bot. name? used for ribs under tiles.
खरवत or ती	Ficus asperrima, *Roxb.*
खरशिंग	Bignonia xylocarpa, *Roxb.*
खरशिंगळ or खरशिंगूळ or खरसमुळी.	Canavalia ensiformis, *DC.*
खरोटा	Epicarpurus orientalis, *Blume.*
खरोली	Streblus asper, *Lour.*
खर्डी	Cressa cretica, *Linn.*
खजूर or री	Phœnix sylvestris, *Roxb.*
खसखसाचें झाड	Papaver somniferum, *Linn.*
खांखिण	Salvadora oleoides, *Dcne.* and S. persica, *Garcin.*
खाजकुली	Fleurya interrupta, *Wight.*
खांडवेल	Ventilago madraspatana, *Gærtn.*
खातानिंब	Melia Azadirachta, *Linn.*
खापरा or खाप्रा	Trianthema monogyna, *Linn.*
खारवांगी	Solanum melongena, *Linn.*
खारानरवेल	Premna integrifolia, *Linn.*
खारीवागेटी	Paramigyna monophylla, *Wight.*
खाक्षी or खाकसी	Sisymbrium Irio, *Linn.* The seeds from Presia.
खित्मी	Althæa officinalis, *Linn.* Imported from Persia.
खिरणा or खिरणी	Mimusops hexandra, *Roxb.*
खिरा	Cucumis sativus, *Linn,*
खीरकिंडा	Jatropha nana, *Dalz.*
खुटणी	?
खुबाझी	Malva sylvestris, *Linn.*
खुरचांपा or खैरचांपा	Plumeria acutifolia, *Poiret.*

खुरी	?
खेर or खैर or खदिर	Acacia Catechu, *Willd.*
खोरट	Allium Porrum, *Linn.*
खोरासानीओंवा or अज्वान	Hyoscyamus niger, *Linn.* The seeds from Persia.
खोरेती	Ficus asperrima, *Roxb.*
खौस्सी	Sterculia colorata *Roxb.*
गंगावती	?
गजकर्णी	Rhinacanthus communis, *Nees.*
गजगा	Cæsalpinia Bonducella, *Roxb.*
गजपिंपळी	Scindapsus officinalis, *Schott.*, and Balanophora indica.
गडगवेल	Vandellia pedunculata, *Benth.*
गणतगर	Tabernæmontana coronaria, *Br.* var. with large clusters of flowers.
गणेशकंद or कांदा	Scindapsus pertusus, *Schott.*
गदनीकंद or गदोबीकंद	Crinum ornatum.
गंधराज	Gardenia florida, *Roxb.*
गंधाटी	Aristolochia bracteata, *Retz.*
गनेरी	Cochlospermum Gossypium, *DC.*
गरंगेरी	Flemingia sp. ?
गरारी	Lebedieropsis orbicularis, *Müll.-Arg.*
गरुडवेल or गरोळ	Tinospora cordifolia, *Miers.*
गवरीचे केश	?
गवरीचे हात or गौरीचे हात	A fern. Bot. name ?
गवला	Prunus Mahaleb, *Linn.*
गवळी	Ipomœa campanulata, *Don.*
गवेंडा	A shrub. Bot. name ?
गहुळा	Prunus Mahaleb, *Linn.*
गहूं	Triticum sativum, *Lam.*
गाजर or गर्जर	Daucus Carota, *Linn.*
गांजा	Cannabis sativa, *Linn.*
गांधउंबर	Ficus hispida, *Linn. f.*
गायतेरडा	Impatiens Balsamina, *Linn.*
गायदवण	Crinum augustum, *Roxb.*
गारंबी or गारबी or गारभी or गर्दल.	Entada scandens, *Bth.*
गिलकी or ची	Luffa acutangula, *Roxb.*, cultivated.
गीदस	Hamiltonia mysorensis, *W. & A.*

गुंगलाय	Cochlospermum Gossypium, *DC.*
गुगुळ	Balsamodendron sp. var. and their exudations.
गुंज	Abrus precatorius, *Linn.*
गुजर	Sarcocolla gum, from Persia.
गुंजवला	?
गुंजागवत	?
गुटी or गूटवेल	Smilax ovalifolia, *Roxb.*
गुडारीचा कांदा	Costus speciosus, *Sm.*
गुडूची	Cocculus Leæba, *D. C.*
गुंद or गुंदणी or गॉंदणी	Cordia Rothii, *Röm et Schult.*
गुंद्रा	Panicum sp ?
गुमुड	Gmelina arborea, *Roxb.*
गुरगिंडी	?
गुरमाळी	?
गुरार	Albizzia procera, *Benth.*
गुल	Rosa damascena, *Mill.*
गुलछडी or गुलशबू	Polianthes tuberosa, *Linn.*
गुलझाफ्री	Tagetes erecta, *Linn.*
गुलटोप	?
गुलड	Ficus glomerata, *Roxb.*
गुलतुरा	Poinciana regia, *Bojer.*
गुलदाउदी	Chrysanthemum indicum. *Roxb.*
गुलनार	Punica Granatum, *Linn.* The double flowers.
गुलपिस्ता	Pistacia terebinthus, *Linn.* The galls,
गुलंब	Machilus glaucescens, *Nees.*
गुलबस or गुलबास or गुलबाक्ष,	Mirabilis Jalapa, *Linn.*
गुलमखमल	Gomphrena globosa, *Roxb.*
गुलमेंधी or मेहंधी	Impatiens balsamina, *Linn.*
गुलमोहर	Poinciana regia, *Bojer.*
गुलवेल	Tinospora cordifolia, *Miers.*
गुलशाम	Eranthemum nervosum, *Wall.*
गुलाब	Rosa damascena, *Mill.*
गुलाबीजांब	Eugenia Jambos, *Linn.*
गुल्लाला	Papaver Rhæas, *Linn.*
गुली घापीस	A kind of Gentian imported from Persia.
गुळवेल or गिरोळी	Tinospora cordifolia, *Miers.*

गुळी	Indigofera tinctoria, *Linn.*
गूटी or गूती	Smilax ovalifolia, *Roxb.*, Colubrina asiatica, *Brogn.* Zizyphus xylopyrus, *Willd.*
गूयबाबूळ	Acacia Farnesiana, *Willd.*
गूर	Mappia oblonga, *Miers.*
गेंडल	Vitis repanda, *W. & A.*
गेतना	Digera arvensis, *Forsk.*, which is Achyranthes alternifolia, *Linn.*
गेंदीतगर	Tabernæmontana coronaria, *Br.*, var. with clustered flowers.
गेवा	Excæcaria Agallocha, *Willd.*
गेळ or गेळी	Randia dumetorum, *Lam.*
गैमरील	Hedyotis auricularia, *Linn.*
गोकर्ण or गोकर्णी	Clitoria Ternatea, *Linn.*
गोखरू	Pedalium Murex, *Linn.*, Tribulus terrestris, *Linn.*
गोजिव्हा	Echium sp. from Persia.
गोडइंद्रजव	Wrightia tinctoria, *Br.* The seeds.
गोडउंडी or गोडीउंडी	Ochrocarpus longifolius, *Benth.*
गोडसुरिंजान	The sweet Hermodactyl.
गोडाएरंड	Ricinus communis, *Linn.*
गोडीकुंयली	Mucuna pruriens, *DC.*, cultivated var.
गोडेकरांदे	Dioscorea bulbifera, *Linn.*, cultivated var.
गोंधण or गोंधणी	Cordia Myxa, *Linn.*
गोपाळी	Anisomeles ovata, *R. Br.*
गोभी	A medicinal herb. Bot. name ?
गोमा	Leucas longifolia, *Benth.*
गोमेटी	Zeyneria umbellata, *Thwaites.*
गोरखगांजा	A small medicinal plant used in नळगूद.
गोरखचिंच	Adansonia digitata, *Linn.*
गोरखमुंडी	Sphæranthus indicus, *Linn.*
गोरदार	Sterculia guttata, *Roxb.*
गोराडू	Dioscorea alata, *Linn.*
गोराणी	?
गोरेआ	Lavandula Burmanni, *Benth.*
गोल	Sponia orientalis, *Planch.*
गोवारी	Cyamopsis psoralioides, *D. C.*
गोविंदी	Capparis zeylanica, *Linn.*

गोविंदु	Diospyros Goindu, *Dalz.*
गोवेल	A creeping shrub. Bot. name ?
गोहागरी लकडी	Strychnos colubrina, *Linn.* The wood.
गोळण	?
गोळी	?
गोक्षुर or गोक्षुरक	Pedalium Murex, *Linn.*
गौजबान or गौझबान	Echium sp. from Persia.
गौळी	Grewia polygama, *Roxb.*
घणसकांडें or घणसवेल	Scindapsus pertusus, *Schott.*
घणसरी or घणसूर	Croton oblongifolium, *Roxb.*
घनोरी	Premna latifolia, *Roxb.*
घरभुली	Datura Stramonium, *Linn.*, var. Tatula. The dried fruit imported.
घागरीकोळसुंदा	?
घाटीपित्तपापडा	Rostellularia procumbens, *Nees*, and Rungia repens, *Nees.*
घायपत or घायपात or घायमार or घायमारी or घायाळ.	Bryophyllum calycinum, *Salisb.*
घायभरी	?
घारकिून	Agaricus officinalis, Polyporus officinalis, *Fries.*
घांसपित्तपापडा	?
घेवडा	Dolichos Lablab, *Linn.*
घोगरा	Gardenia latifolia, *Aiton.*
घाट	Zizyphus xylopyrus, *Willd.*
घोंटवेल or घोंटीवेल	Smilax ovalifolia, *Roxb.*
घोनसफन	Sansevieria zeylanica, *Willd.*
घोसाळी or घोंसाळी	Luffa acutangula, *Roxb.*
घोळ	Mengea tenuifolia, *Moq.*
चई	Alysicarpus vaginalis, *DC.*
चक्रभेंड or डी	Abutilon indicum, G. *Don.*
चक्रमर्द	Cassia occidentalis, *Linn.*
चंडमूला or चंडहासा	Kæmpferia Galanga, *Linn.*
चणा	Cicer arietinum, *Linn.*
चणोटी	Abrus precatorius, *Linn.*
चंदन	Santalum album, *Linn.*
चंदनबटवा	Chenopodium album, *Moq.*
चंदर	Macaranga tomentosa, *Wight.*
चंद्रकांत	Calonyction speciosum, *Chois.*

चंद्रस	Callitris quadrivalvis, *Vent.* The gum.
चंद्रुस	Vateria indica, *Linn.*
चंपक	Michelia Champaca, *Linn.*
चपयेल	Canthium Leschenaultii, *W. & A.*
चपळा	Mimosa sp. ?
चंबारी or चंबरयेल	Premna scandens, *Roxb.*
चमेल or चमेली	Jasminum grandiflorum, *Linn.*
चरस	Cannabis sativa, *Linn.* The resinous exudation.
चवई or चवईण	Musa superba, *Roxb.*
चवक	Piper Chaba, *Bl.*
चवर	Curcuma caulina, *Graham.*
चवळवेल	Dolichos sinensis, *W. & A.*
चऱ्हेणी or चोऱ्है	Musa superba, *Roxb.*
चहा	Camellia theifera, *Griff.*
चाई or चिपलीचाई	An esculent plant. Bot. name ?
चाकवत or चाकोता	Rumex vesicarius, *Linn.*
चाक्सू	Cassia Absus, *Linn.*
चांद or चांदा or चांदवड or चांदाडा or चांदोड.	Macaranga tomentosa, *Wight.*
चांदुल	Antiaris toxicaria, *Leesch.*
चांदवेल	Calonyction speciosum, *Chois.*
चापा or चांपा	Michelia Champaca, *Linn.*
चांबुळी or चंबुर or चंबुली	Bauhinia Vahlii, *W. & A.*
चांभारीगवत	?
चाम्हारहिरडा or चाम्हारीहिरडा	Terminalia Chebula, *Retz.*
चाम्हारी	Premna scandens, *Roxb.*
चायेन	Dioscorea pentaphylla, *Willd.*
चार or चारोळी	Buchanania latifolia, *Roxb.*
चालमोग्रा or चावलमुंग्री	Gynocardia odorata, *R. Br.*
चावर	Curcuma caulina, *Dalz.*
चिकणकांकडी	Cucumis Melo, *Linn.*, var. utilissimus, C. utilissimus, *Roxb.*
चिकणा	Sida cordifolia, *Linn.*
चिकणा थोरला	Tetranthera apetala, *Roxb.*
चिकणा लहान	Sida carpinifolia, *Linn.*
चिकणी	Sida sp. var.
चिकू	Achras Sapota, *Linn.*

चिघळ	A vegetable growing wild. Bot. name ?
चिंच or चिंचा	Tamarindus indica, *Linn.*
चिंचनडा, चिंचवा	Albizzia odoratissima, *Benth.*
चाचिणी	Mimosa sp. A cattle fodder.
चिंचुरटी or डी or चिंचोरटी or डी.	Solanum indicum, *Linn.*
चिंचोला	Albizzia Lebbek, *Benth.*
चित्रक	Plumbago zeylanica, *Linn.*
चिनईघास	Gelidium, Gracillaria, Plocaria, sp. var.
चिनईमेंदी	Lagerstræmia indica, *W. & A.*
चिनईसरू	Casuarina muricata, *Roxb.*
चिनईसालिट	Pisonia morindifolia, *Plum.*
चिनईकोलंजन	Alpinia officinarum, *Hance.*
चिपारी	?
चिबूड or चिभट or ड or चिभाड or चिभूट or ड.	Cucumis Melo, *Linn.* The Melon.
चिमणट्टी	Indigofera pulchella, *Roxb.*
चिमर or चक्षु	Cassia Absus, *Linn.*
चिरचोळी	Vangueria spinosa, *Roxb.*
चिरपुटी	Zanonia indica, *Linn.*
चिरफळ or ळी	Zanthoxylon Rhetsa, *DC.*
चिरबुटली or चिरबोटी	Physalis indica *Lam.*
चिराईत or चिरायत	Swertia Chirata, *Ham.*
चिराटी	Mukia scabrella, *Arn.*
चिऱ्हाट or चिऱ्हांट	A creeper, Bot. name ?
चिलघोझा ।	Pinus Gerardiana, *Wall.* The nuts from Afghanistan.
चिलबिज	Strychnos potatorum, *Linn. f.*
चिल्लर	Cæsalpinia sepiaria, *Roxb.*
चिलार or री or चिल्हार or री.	Acacia Intsia, *Willd.*
चिल्ला or चरी	Casearia tomentosa, *Roxb.*
चिवारी	Bambusa Arundo, *Klein.*
चीना	Dioscorea sativa, *Willd.*
चीमट	Scutia indica, *Brogn.*
चीर	Pinus longifolia, *Roxb.* The turpentine from Northern India.
चील	A vegetable. Bot. name ?
चुकंदर	Beta vulgaris, *Moq.*
चुका or चुकाचाकवत or चुकाचाखवत.	Rumex vesicarius, *Linn.*

चुंच	Sesbania aculeata, *Pers.*
चुलाईभाजी	Euxolus polygamus, *Moq.*
चेंडुफुल	Parkia biglandulosa, *W. & A.*
चेर or चेरा or चौरा	Erinocarpus Nimmoanus, *Grah.*
चोंचें	Corchorus capsularis, *Linn.*
चौधारी or चारपट्टी	Psophocarpus tetragonolobus, *Neck.*
चौधारीकांडवेल	Vitis quadrangularis, *Wall.*
चौधारीनिवडुंग	Euphorbia neriifolia, *Linn.*
चौलमोग्रा	Gynocardia odorata, *Br.*
चौळई	Dolichos sinensis, *W. & A.*, also Euxolus polygamus, *Moq.*
जखमी	Dodonæa viscosa, *Linn.*
जगदळा	Oroxylon indicum, *Bth.*
जंगम	Flacourtia cataphracta, *Roxb.*
जंगली अखोट	Aleurites moluccana, *Willd.*
,, अनानस or जंगली कुंवार	Agave americana, *Linn.*
,, एरंड	Jatropha glandulifera, *Roxb.*
,, कांदा	Urginea indica, *Kunth.*
,, कापशी	Urena sinuata, *Linn.*
,, काळीमिरची	Toddalia aculeata, *Pers.*
,, किरायत	Erythræa Roxburghii, *G. Don.*
,, गंगा or गांजा	Desmoddium laxiflorum, *DC.*
,, तीळ	Sesamum indicum, *Linn.*
,, तेजराज	?
,, पडवळ	Trichosanthes cucumerina, *Linn.*
,, पत्री	?
,, पियाज	Urginia indica, *Kunth.*
,, बदाम or बादाम	Sterculia fœtida, *Linn.*
,, बाजरी	Typha latifolia, *Willd.*
,, भेंडा	Hibiscus tetraphyllus, *Roxb.*
,, भेंडी	Anictoclea Grahamiana, *Nimmo.*
,, भोजराज	?
,, मठ	Phaseolus trilobus, *Ait.*
,, मुद्रिका	Papaver Rhæas, *Linn.*
,, मुळी	Laggera aurita, *Schultz-Bip.*
,, मेथी	Desmodium triflorum, *DC.*
,, लवंग	Eugenia caryophyllæa, *Wight.*
,, लसन	Allium sp. ?

जंगली सुरण	Amorphophallus campanulatus, *Blume*, and Arum sp. var.
,, हरबरा	?
जटामांसी	Nardostachys Jatamansi, *DC.* The rhizomes imported.
जडीराष्णा	?
जती	Cosmostigma racemosum, *Wight.*
जद्वार	Delphinium denudatum, *Wall.* Tubers imported.
जपाळ	Croton Tiglium, *Linn.*
जमरूद	Psidium Guyava, *Raddi.*
जमालगोटा	Croton Tiglium, *Linn.*, and Baliospermum montanum, *Müll-Arg.*
जयंती	Sesbania ægyptiaca, *Pers.*
जयपाळ	Croton Tiglium, *Linn.*
जरणी	?
जरदाळू	Prunus armeniana, *Linn.* The imported fruit.
जरांकुश	Andropogon laniger, *Desf.*
जलपाई	Elæocapus robustus, *Roxb.*
जव	Hordeum vulgare, *Linn.*
जवशी or जवस	Linum usitatissimum, *Linn.*
जवाशी or सी or जवासा	Alhagi maurorum, *Desv.*
जवाशीर	Ferula galbaniflua, *Boiss.* The gum-resin from Persia.
जहरी सोनटक्का	Allamanda cathartica, *Linn.*
जळरूख	?
जाई or जाती	Jasminum auriculatum, *Roxb.*
जाईफळी or जायफळ	Myristica moschata, *Willd.*
जाकारा	Justicia verticillata, *Roxb.*
जानवेली	Lygodium pinnatifidum, *Spr.*
जाफर	Bixa Orellana, *Linn.*
जाफरी गुंदी	Gomphrena globosa, *Roxb.*
जांब or जांभ	Xylia dolabriformis, *Benth.*
जांबळी or जंबूल or जांबूळ or जांभूळ.	Eugenia Jambolana, *Lam.*
जांबा	Eugenia Jambos, *Linn.*
जांभीर or जंबीर	Citrus medica, *Linn.*
जांभळदेवदार	Guatteria longifolia, *DC.*!

आयपत्री	Myristica moschata, *Willd.* Mace.
जास्वंद or जास्वन or जासुदं or जासुमी or जास्वंदी or जासुंदी.	Hibiscus Rosa-Sinensis, *Linn.*
जिनसिंग	Panax Ginseng, *C. A. Myer.* Imported from China.
जिबूड or चिबूड	Cucumis Melo, *Linn.*
जिरणी	?
जिऱ्हूळ	Milletia auriculata, *Baker.*
जिरें	Cuminum Cyminum, *Linn.*
जीवनपुतर	Putranjiva Roxburghii, *Wall.*
जुंई	Jasminum auriculatum, *Roxb.*
जुरी	Atriplex hortensis, *Linn.*
जेजेवंती	A flowering creeper, Bot. name ?
जेंतीआना	Gentiana lutea, *Linn.* The imported root.
जेष्टमध or जेष्टीमध	Glycyrhiza glabra, *Linn.*
जेहेरीनारळ	Lodoicea sechellarum, *Labill.*
जोंध्रा	Antidesma Ghæsembilla, *Gärtn.*
जोंधळा or ज्वार or ज्वारी	Holcus Sorghum, *Roxb.*
झरस	Mollugo pentaphylla, *Linn.*
झरावंदएकलान	Aristolochia longa, *Linn.* Imported from Persia.
झरावंदएगरद	Aristolochia rotunda, *Linn.* Imported from Persia ; also Penilia tuberifera, often sold in lieu of it.
झाऊ	Tamarix gallica, *Linn.*
झाडखीरकंद	?
झाडी हळदी	Coscinium fenestratum, *Colebr.*
झिरंग	Murraya Kœnigii, *Spreng.*
झीपीगाठी किराईत	Smilacina fusca.
झुफईयाबीस or झोफेयाबीस	Hyssop, from Persia. Bot. name ?
झेंडू	Parkia biglandulosa, *W. & A.*
टकमक or की	Cucumis trigonus, *Roxb.*, var. pubescens, which is eaten.
टंकारी	Physalis peruviana, *Don.*
टांकला or टाकळा or टांकळा	Cassia Tora, *Linn.*
टायिटू	Oroxylum indicum, *Benth.*
टिकजांभूळ	Eugenia aquea, *Burm.*
टिटल	Tabernæmontana dichotoma, *Roxb.*

टिंव	Gendarussa vulgaris, *Nees.*
टेट or टेंटवी or टेंटू	Oroxylum indicum, *Benth.*
टेंबुरणी or टेंभुरणी or टेंबुर्णी	Diospyros Tupru, *Buch-Ham.*, and D. Embryopteris, *Pers.*
ठेगी	Cyperus bulbosus, *Vahl.*
डवला	Uraria lagopoides, *DC.*
डांकू	A creeping plant. Bot. name?
डांगर	Cucurbita Pepo, *DC.*
डांगळी	Panicum ? sp.
डाय	Desmodium gangeticum, *DC.*
डालिम or डाळिब	Punica Granatum, *Linn.*
डिकना	Ardisia humilis, *Vahl.*
डिकवेल	Tylophora carnosa, *Wall.*
डिकेमाली	Gardenia gummifera, *Linn. f.*, and G. lucida, *Roxb.*
डुकरमुंगळी	Tapinocarpus indicus, *Dalz.*
डोंगरीमदनमस्त	?
डोंगरीमायफळ	Chrysophyllum Roxburghii, *Don.*
डोरली or डोर्ली	Solanum indicum, *Linn.*
ढवळ	Lobelia nicotianæfolia, *Heyne.*
ढोळ	Lindenbergia urticæfolia.
ढोलआंबा	Spondias mangifera, *Pers.*
तगर	Tabernæmontana coronaria, *Br.*
तगरगंठोडा	Valeriana Hardwickii, *Wall.*
तज	Cinnamomum sp. var. in India. The bark, Indian cinnamon.
तंत्री	?
तंबाखू	Nicotiana Tabacum, *Linn.*
तमाल	Garcinia xanthochymus, *Hook. f.*
तमण	Lagerstræmia Flos-Regina, *Retz.*
तमाला	Cinnamomum Tamala, *Nees.*
तरटी or तरंटी	Capparis horrida, *Linn. f.*
तरडी	?
तरतर	Diospyros Tupru, *Buch-Ham.*
तरबूज	Cucumis Melo, *Linn.*
तरवटा	Cassia Tora, *Linn.*
तरवड	Cassia auriculata, *Linn.*
तरसीफळ	Chrysophyllum Roxburghii, *Don.*
तवकीरा or तवकीलाचें झाड	Curcuma angustifolia, *Roxb.*

तवशी or तवशीण	Cucumis Melo, *Linn.* var. utilissimus (*sp. Roxb*).
तवीर	Garcinia ovalifolia, *Hook. f.*
ताग	Crotalaria juncea, *Linn.*
तागुरवेल	?
ताड or ताल	Borassus flabelliformis, *Linn.*
तांदूळ	Oryza sativa, *Linn.*
तांदुळजा	Amarantus oleraceus, *Roxb.*
तापमारी	Aralia guilfolia.
तांबट	Andropogon glaber, *Roxb.*, also Flacourtia sepiaria, *Roxb.*
तांबडाकुडा	Wrightia tomentosa, *Roem. & Schult.*
तांबडाकुंभा	Careya arborea, *Roxb.*, var. ?
तांबडामाठ	Amarantus oleraceus, *Roxb.*
तांबडीजास्वंद	Hibiscus Rosa-Sinensis, *Linn.* Red var.
तांबडीदुपारी	Pentapetes phœnicea, *Linn.*
तांबडें कमळ	Nymphæa Lotus, *Linn.*
तांबडेतुऱ्याची कचर	Curcuma aromatica, *Salisb.*
तांबडेंनागकेशर	Ochrocarpus longifolius, *Benth & Hook. f.*
तांबडेपानांची चांदवेल	Vitis discolor, *Dalz.*
तामन	Lagerstræmia Flos-Reginæ, *Retz.*
तामरूज	Elæodendron glaucum, *Pers.*
तारक	Alpinia Allughas, *Rosc.*
तालमूली	Curculigo orchioides, *Gaertn.*
तालिमखाना	Hygrophylla spinosa, *T. And.*
तालिसपत्र	Taxus baccata, *Linn.*
तिधारी or त्रिधारीकांडवेल	A rare var. of कांडवेल, which see.
तिधारी or त्रिधारीनिवगडुंग	Euphorbia antiquorum, *Linn.*
तिरडा or तेरडा	Impatiens Balsamina, *Linn.*
तिरफळ	Zanthoxylon Rhetsa, *DC.*
तिरमिश	Lupinus albus, *Linn.* Seeds imported.
तिरिंग	A shrub eaten by cattle. Bot. name ?
तिल or तीळ	Sesamum indicum, *Linn.*
तिवत	Butea superba, *Roxb.*
तिवर	Avicennia officinalis, *Linn.*
तिवस or तेवस	Butea superba, *Roxb.*
तिसळ	Zanthoxylon Rhetsa, *DC.*
तिळवण	Gynandropsis pentaphylla, *DC.*

तिळ्यावेल	A creeper with a seed like Sesamum. Bot. name ?
त्रिपक्षी	Coldenia procumbens, *Linn.*
त्रिफळ	Zanthoxylon Rhetsa, *DC.*
तीनपानी	Naregamia alata, *W. & A.*
तीपिन	Schmiedelia villosa, *Roxb.*
तीरप	Trigonella corniculata, *Linn.*
तीलपर्णी	Gynandropsis pentaphylla, *DC.*
तीवर	Barringtonia acutangula, *Gaertn.*
तीसूळ	Heynea trijuga, *Roxb.*
तुकटी or तुपकारिया	Sida carpinifolia, *Linn.*
तुकमीबालंग	Lallemantia Royleana, *Bth.* The seeds imported.
तुखमिरीहान	Ocimum Basilicum, *Linn.* The seeds imported.
तुडतुडा	?
तुन	Cedrela Toona, *Roxb.*
तुपकडी or तुपकड्या	Sida carpinifolia, *Linn.*
तुंबा	Leucas Cephalotes, *Spr.*
तुंबी	Lagenaria vulgaris, *Seringe.* The dried bottle made from it is तुंबा
तुरई	Luffa acutangula, *Roxb.*
तुरंजबीन	Alhagi manna, from Persia.
तुळतुळी	Holostemma Rheedii, *Spr.*
तुळस or शी or तुलसी	Ocimum sanctum, *Linn.*
तूट	Morus indica, *Linn.*
तूपवेल	?
तूर	Cajanus indicus, *Spr.*
तेजकंद	?
तेजफळ or तेजबळ	Zanthoxylon alatum, *Roxb.*
तेजोवती	Cardiospermum Halicacabum, *Linn.*
तेंटू	Oroxylum indicum, *Benth.*
तेंड	Ipomœa Turpethum, *Br.*
तेंडफळ or तेंडळी	Cephalandra indica. *Naud.*
तेंडुक or तेंडू	Diospyros melanoxylon, *Roxb.*
तेरडा	Impatiens Balsamina, *Linn.*
तेरी or तेरें or तेरेंअळू	Colocasia antiquorum, *Schott.*
तेलउंडी	Calophyllum inophyllum, *Linn.*
तेल्यादेवदार	Cedrus Deodara, *Loud.*

तेवडी	Ipomœa Turpethum, *Br.*
तेवस or तनज	Ougeinia dalbergioides, *Benth.*
तोंडली	Cephalandra indica, *Naud.*
तोंडा	?
तोंड्या	?
तोड्री	Lepidium Iberis, *Linn.* The seeds imported.
तोरण	Zizyphus rugosa, *Lamk.*
तृणवृक्ष	Cedrela Toona, *Roxb.*
त्रायमाण	Delphinium saniculæfolium, *Boiss.*
त्रिकाळी	Malva sylvestris, *Linn.*
थरडुरीभाजी	Leucas aspera, *Spr.*
थरमरें	A shrub; the leaves are used for making chutney.
थाटा	A tree used for fencing.
थानमोडी	Physalis minima, *Linn.*
थुवर or थोर	Euphorbia Tirucalli, *Linn.*
थोरआग्या	Tragia involucrata, *Müll-Arg.*
थोर इंद्रावणी	?
थोरकरंज	Pongamia glabra, *Vent.*
थोरनिवडुंग	Euphorbia neriifolia, *Linn.*
थोरपिंपळी	Scindapsus officinalis, *Schott.*
थोरराळेचा वृक्ष	Shorea robusta, *Gærtn.*
थोररुई	Calotropis procera, *R. Br.*
थोरलीगुंज	Adenanthera pavonina, *Linn.*
थोरलीपाडळ	Cocculus villosus, *DC.*
दंडूस	Dalbergia lanceolaria, *Linn.*
दंती	Urostigma volubile, *Dalz.*
दर्भ	Poa cynosuroides, *Linn.*
दर्यायीनारळ	Lodoicea Sechellarum, *Labill.*
दवणशेवती	Chrysanthemum indicum, *Linn.*
दवणा	Artemisia Sieversiana, *Willd.*
दशमुळी	Eranthemum roseum, *Rœm. & Schult.*
दांडेबोर	Zizyphus Jujuba, *Lamk.* var.
दांतर or दांतूर or दांतीर	Urostigma volubile, *Dalz.*
दातरंग	Ehretia lævis, *Roxb.*
दादमर्दन	Cassia alata, *Linn.*
दाब्रिआ or दाडरा	Anogeissus latifolia, *Wall.*
दारकोंहोळा	Benincasa cerifera, *Savi.*

दाराचिनी or दालचिनी	Cinnamomum sp. var.
दारहळद or दारुहळद	Berberis sp. var. The imported wood.
दारूरी	Argemone mexicana, *Linn.*
दावनमलगी	Chrysanthemum indicum, *Linn.*
दांवेफणस	Artocarpus integrifolia, *Linn.* The kind bearing fruit on the roots.
दिंगाली Or दिंग्ली	Crotalaria Leschenaultii, *DC.*
दिंडा	Leea macrophylla, *Roxb.* दिंडी L. crispa, *Willd.*
दिपमाळ	Leonotis nepetifolia, *Don.*
दिबादिबी	Cæsalpinia coriaria, *Willd.*
दिलपसंद	Citrullus vulgaris, *Schrad.*, var. fistulosus.
दिवाळी	Cucumis trigonus, *Roxb.*
दिसमावळी	Asparagus racemosus, *Willd.*
दुदुरली	Holostemma Rheedii, *Spr.*
दुधणी or दुधाणी	Ipomœa Turpethum, *Br.*
दुधरी	A vegetable. Bot. name ?
दुधवेल or दुधानी or दूधिका	Oxystelma esculentum, *Br.*
दुध्याभोंपळा	Lagenaria vulgaris, *Seringe.*
दुधियामिसरी	?
दुधीण	Lagenaria vulgaris, *Seringe.* Straight var.
दुधीवन	Cordia Wallichii, *G. Don.*
दुपानीलता	Ipomœa biloba, *Forsk.*
दुपार or दुपारी	Pentapetes phœnicea, *Linn.*
दुरवी or दुर्वा	Cynodon Dactylon, *Pers.*
दुलबचंपा	Hedychium coronarium, *Linn.*
दूंड	Isachne elegans, *Dalz.*
दूधकलमी	Ipomœa Turpethum, *Br.*
दूधभोपळी	Lagenaria vulgaris, *Seringe.*
देंटीपानवेल	Piper Betle, *Linn.*, var.
देवकांचन	Bauhinia purpurea, *Linn.*
देवकापशी or ण	Gossypium religiosum, *Linn.*
देवकुंभा	Ipomœa Turpethum, *Br.*
देवकेळ or ळी	Canna indica, *Linn.*
देवडांगर or री	Luffa echinata, *Roxb.*
देवदार or देवदारु	Cedrus Deodara, *Loudon,* also Erythroxylon monogynum, *Roxb.*
देवदारी	Cedrela Toona, *Roxb.*

देवनळ or नाळ	Arundo tibialis ?
देवबाभळ	Acacia latronum, *Willd.*
देवभात	Oryza sativa, *Linn.* Wild var.
दोडकी	Luffa acutangula, *Roxb.*
दोरी	Hoya viridiflora, *R. Br.*
दौदौला	Flemingia congesta, *Roxb.*
द्राक्ष	Vitis vinifera, *Linn.*
धईआळी	?
धत्तुरा or धत्तूर or धुतरा or धोतरा.	Datura fastuosa, *Linn*, and var. Alba (D. alba, *Nees*).
धणा or धना or धाना	Coriandrum sativum, *Linn.*
धमासा	Fagonia arabica, *Linn*,
धाऊस	Woodfordia floribunda, *Salisb.*
धाकटा करवत	?
धाकटा कुंवार	Aloe vera, *Linn.*, var. littoralis (sp. König.)
धाकटी दुधी	Euphorbia prostrata, *Willd.*
धाकटी मोडण	?
धाकटी शेरण	Eugenia lanceolaria.
धाकटी शेवाळी	Ceratophyllum submersum.
धामण or णी	Grewia tiliæfolia, *Vahl.*
धामुक	Acacia arabica, *Willd.* The seeds.
धायरी धावडा or डी धावशी or धावस	Woodfordia floribunda, *Salisb.*
धुपाचें झाड	Pinus longifolia, *Roxb.*
धुपाळी धूपसाळी	Juniperus excelsa, *M. Bieb.*, also Boswellia serrata, *Roxb.*
धेंडशी	A small white gourd; its fruit is called धेंडस or धेंडसें.
धैवन	Cordia Macleodii, *Hook. f. & Th.*
नकाछिंकणी or नकशिंकणी	Centipeda orbicularis, *Lour.*
नखसिकणी	Hoya viridiflora, *R. Br.*
नथ	Ischæmum pilosum, *Wight.*
नफटकी	Cardiospermum Halicacabum, *Linn.*
नदरुकी or नंद्रुक	Urostigma retusum, *Miquel.*
नयाम्र	Ficus hispida, *Linn. f.*
नरकचूर	Curcuma cæsia, *Roxb.*
नरगी	Elœagnus Kolaga, *Schlecht.*
नरलवंग	Caryophyllus aromaticus, *Linn.* The fruit.

नरवेल	Naravelia zeylanica, *DC.*, also Viburnum fetidum, *Wall.*, and Premna integrifolia, *Linn.*
नरशेज or नरसेज	Euphorbia neriifolia, *Linn.*
नरांबा	?
नलकूट	Sagittaria obtusifolia, *Linn.*
नहरौ	Casearia graveolens, *Dalz.*
न्हईआंजण	Hardwickia binata, *Roxb.*
नाई	Sphœranthus indicus, *Linn.*
नाऊळ	Ipomœa vitifolia, *Sw.*
नाकशिंकणी	Centipeda orbicularis, *Lour.*
नाकेशर or नागकेशर	Cassia buds from Cinnamomum iners, *Rwdt.*, and C. Cassia, *Bl.*
नागकूडा	Morinda citrifolia, *Roxb.*
नागचंपक or नागचापा or नागचाफा.	Mesua ferrea, *Linn.*
नागदवण or नागदन or नागदौण.	Crinum asiaticum, var. toxicarium, *Herb.*
नागफणीचांपा	Alpinia nutans, *Roxb.*
नागपुरीबचनाग	Aconitum ferox, *Wall.*
नागमल्ली	Rhinacanthus communis, *Nees.*
नागमुष्टी	Strychnos colubrina, *Linn.*
नागरचिनें	Dioscorea alata, *Linn.*
नागरमोथा	Cyperus pertenuis, *Roxb.*
नागलकुडा	Morinda citrifolia, *Roxb.*
नागला	?
नागली or नाचणी	Eleusine coracana, *Gärtn.*
नागवल्ली or वेल नागिणवेल	Piper Betle, *Linn.*
नांदरूक or ख or नांद्रुक or की or खी or नांदुरकी	Urostigma retusum, *Miquel.*
नांदेट	Tabernæmontana coronaria, *Br.*
नाना	Lagerstrœmia parviflora, *Hook.*
नाय	Sphæranthus indicus, *Linn.*
नायटी	Euphorbia thymifolia, *Burm.*
नायरी	?
नारंग or गी or नारिंगी	Citrus Aurantium, *Linn.*
नारळमाड or नारळी or नाराळीमाड.	Cocos nucifera, *Linn.*
नावलीचा वेल	Ipomœa vitifolia, *Sw.*

नासजंगी	?
नाळीची भाजी	Ipomœa reptans, *Poir.*
निडबा	?
निनै	Diospyros chloroxylon, *Roxb.*
निंब	Melia Azadirachta, *Linn.*
निंबारा	Melia dubia, *Cav.*
निभालकंद	?
निर्गुंड or डी or निगड or निगूंड or निर्गूडी.	Vitex negundo, *Linn.*, and V. trifolia, *Linn.*
निर्मळा or निर्मळी or निवळी	Strychnos potatorum, *Roxb.*
निर्विषी	Applied to several drugs, the nirvishi of Sanskrit writers is Kyllingia monocephala, *Linn.*
निवडुंग	Euphorbia neriifolia, *Linn.*
निवल or ली	Euphorbia Tirucalli, *Linn.*
निवलकांडें	Euphorbia sp.
निशोत्तर	Ipomœa Turpethum, *Br.*
निसूर्डी	Cynoglossum micranthum. *Desf.*
निळाकोऱ्हांटा	Barleria strigosa, *Willd.*
निळी	Commelyna communis, *Linn.*
नीरब्राह्मी	Herpestis Monniera, *H. B. & Kth.*
नीलपुष्पी	Ipomœa hederacea, *Jacq.*
नीलिनी or नीली or नीळ	Indigofera tinctoria, *Linn.*
नीव	Anthocephalus Cadamba, *Miq.*
नीसन	Zinziber Cassumunar, *Roxb.*
नीसलबोंडी	Salacia prinoides, *DC.*
नेग्ली	Polygala chinensis, *Linn.*
नेपती	Capparis aphylla, *Roth.*
नेर	A kind of grass.
नेवकदंबा	Anthocephalus Cadamba, *Miq.*
नेवरुकी	?
नेवाळ or ळी	Jasminum elongatum, *Don.*
नैनिया	Panicum miliare, *Lamb.*
नोडा	Kind of reed. Bot. name?
पचोवंदा	Capparis grandis, *Linn.*
पंजाबीसालम्	Orchis mascula, *Linn.*
पटकूळ or पेटकुळी	Ixora coccinea, *Linn.*
पडवळ or परवर	Trichosanthes anguina, *Linn.*
पतंग	Cæsalpinia Sappan, *Linn.*

पत्रज	?
पत्रिक	Dendrobium Lawanum, *Lindl.*
पद्मणि	?
पद्मकाष्ठ	Prunus Puddum, *Roxb.* The stems imported.
पर्णबीज	Kalanchoe laciniata, *DC.*
पनकूळ	Ixora coccinea, *Linn.*
पनस	Artocarpus integrifolia, *Linn.*
पना	?
पपन्नस or पपनस	Citrus decumana, *Willd.*
पपिता	Strychnos Ignatii, *Bergius.*
पपैया	Carica Papaya, *Linn.*
पभ	Chickrassia tabularis, *Adr. Juss.*
परळ	Stereospermum suaveolens, *DC.*
परिपाट or परिपाटी	Oldenlandia umbellata, *Linn.*
पलांडु	Allium Cepa, *Linn.*
पलाश or पळस	Butea frondosa, *Roxb.*
पलाशी or पळसवेल	Butea superba, *Roxb.*
पवारी	?
पहाडमूळ	Cissampelos Pareira, *Linn.*
पहाडीकिराईत	Swertia angustifolia, *Ham.*
पळें or पळ्हें	Gossypium arboreum, *Linn.*
पाईर	Ficus cordifolia, *Roxb.*
पाकर	Cyclea Burmanni, *Miers.*
पाटी	Phrynium dichotomum, *Roxb.*
पांटी	Dolichos Lablab, *Linn.*
पांगली or पांगळा	Pogostemon purpuricaulis, *Dalz.*
पांगारा	Erythrina indica, *Roxb.*
पाच	Pogostemon Patchouly, *Pellit.*
पाचुंदा	?
पाडळ	Bignonia chelonoides, *Linn.*
पाडावळ धाकटी	Cocculus villosus, *DC.*
पांडू or पापुर	Gardenia latifolia, *Ait.*
पांढर or री	Croton hypoleucos, *Dalz.*
पांढराकुडा	Holarrhena antidysenterica, *Wall.*
पांढराखैर	Acacia ferruginea, *DC.*
पांढराचंदन	Santalum album, *Linn.*
पांढराचित्रक	Plumbago zeylanica, *Linn.*
पांढरामांदार	Erythrina indica, *Lam.* White var.

पांढरीकुडई	?
पांढरीगुंज	Abrus precatorius, *Linn.* White var.
पांढरीरिंगणी	?
पांढरीसांवर	Eriodendron anfractuosum, *DC.*
पाणजिरें	Anisochilus carnosus, *Wall.*
पातरी or पाथरी	Microrhynchus sarmentosus, *DC.*
पाताळतुंबडी	Bovista sp.?
पातीचा चहा	Andropogon citratus, *DC.*
पातीरास्ना	Pluchea lanceolata, *Oliv.*
पाथरचूर	Coleus aromaticus, *Benth.*
पाथ्री	Microrhynchus sarmentosus, *DC.*
पादरीमामी	?
पाद्री	Bignonia suaveolens, *Roxb.*
पानअवळा or ळी	Flacourtia Ramontchi, *L'Herit.*, var sapida.
पानकिंजळ	?
पानकुंभा	?
पानजांभूळ	Syzygium salicifolium, *Wall.*
पानलवंग	Jussiæa villosa, *Lam.*
पानवेल	Piper Betle, *Linn.*
पापटी	Pavetta indica, *Linn.*
पायरा or री	Ficus cordifolia, *Roxb.*
पारंगा	Erythrina indica, *Lam.*
पारयेल	Cissampelos Pareira, *Linn.*
पारिजात or पारिजातक	Nyctanthes Arbor-tristis, *Linn.*
पारिभद्र	Erythrina indica, *Lam.*, also applied to the bitter Neem.
पार्श्वीपिप्पल or पार्श्वपिंपळ	Thespesia populnea, *Correa.*
पालक	Spinacia oleracea, *Mill.*
पालकांडे or पालकांडवेल	Agave americana, *Linn.*
पांलग	Heterophragma Roxburghii, *DC.*
पाला	Ehretia buxifolia, *Roxb.*
पालेहसण	?
पालेंरें	Melastoma malabathricum, *Linn.*
पाल्याचा चहा	Andropogon citratus, *DC.*
पावन	Phyllanthus reticulatus, *Poiret.*
पासी or फासी	Dalbergia paniculata, *Roxb.*
पाहर	Flacourtia Ramontchi, *L'Herit.*
पिंजळ	Terminalia Arjuna, *Bedd.*

पिठवण	Uraria lagopoides, *DC.*
पिंडा	Heracleum Pinda, *Dalz.*
पिंडाळु	Manihot utilissima, *Pohl.*
पित्तपत्र, पित्तपापडा	Fumaria parviflora, *Lamk.*, and officinalis.
पित्तमारी	Tylophora asthmatica, *W. & A.*
पित्तवेल	Naregamia alata, *W. & A.*
पिंपरणी or पिंपरी	Thespesia populnea, *Correa.*
पिंपळ or पिप्पल	Ficus religiosa, *Linn.*
पिंपळगांक	Stillingia sebifera.
पिंपळी or पिप्पली or पिंपळीमूळ.	Piper longum, *Linn.*
पियाल	Buchanania latifolia, *Roxb.*
पिलू	Salvadora persica, *Garcin.*
पिलोक	Combretum Wightianum, *Wall.*
पिरंग	Notonia balsamica, *Dalz.*
प्रियंगु	Aglaia odorata, *Lour.*
पिवळाकांचन	Bauhinia tomentosa, *Linn.*
पिवळाकोरांटा	Barleria prionitis, *Linn.*
पिवळाचांपा	Michelia Champaca, *Linn.*
पिवळाधोतरा	Datura fastuosa, *Linn.*, yellow var., and Argemone mexicana.
पिवळाभांग्रा	Wedelia calendulacea, *Less.*
पिवळा वाळा	Andropogon muricatus, *Retz.*
पिवळीजुई	Jasminum aureum, *Don.*
पिवळीतिळवण	Cleome viscosa, *Linn.*
पिवळी शिरस	Brassica campestris, *Linn.*
पिवार	Barringtonia acutangula, *Gärtn.*
पिसा	Tetranthera monopetala, *Roxb.*
पिस्ता	Pistacia vera, *Linn.*
पिळाचंपा	Michelia Champaca, *Linn.*
पुष्करमूळ	?
पुंग	Areca Catechu, *Linn.*
पुंगळवेल or पुंगळवेली	A scandent shrub. Bot. name ?
पुंड्या or पुंड्याऊंस	Saccharum officinarum, *Linn.*, a var.
पुणाचंपा	Alpinia nutans, *Roxb.*
पुत्येण	A grass. Bot. name ?
पुदीना	Mentha arvensis, *Linn.*
पुन	Calophyllum tomentosum, *Wight.*
पुनई or य	Sterculia fœtida, *Linn.*, and Calophyllum tomentosum, *Wight.*

पुनर्नवा	Boerhaavia diffusa, *Linn.*
पुन्नाग	Ochrocarpus longifolius, *Benth. & Hook.*
पुयतण	A grass. Bot. name ?
पुयाशिरें	A shrub. Bot. name ?
पुलिंजन	Alpinia officinarum, *Hance.*
पुंवण	Phyllanthus reticulatus, *Poiret.*
पुर्वा	Capparis Roxburghii, *DC.*
पेटगुळी	Dalbergia sympathetica, *Nimmo.*
पेटारी	Abutilon indicum, *G. Don.*, also Rottlera dicocca, *Roxb.*, and Trewia nudiflora, *Willd.*
पेंडकुळ or पेंडगुळ	Ixora coccinea, *Linn.*
पेंढर or रा, री or पेंढारी or पेंढू.	Randia uliginosa, *DC.*
पेंधें	A kind of grass. Bot. name ?
पेरअळु	Randia dumetorum, *Lam.*
पेरू	Psidium Guyava, *Raddi.*
पेंवा	Costus speciosus, *Sm.*
पेश	Cylicodaphne Wightiana, *Nees.*
पैंगुली	Ixora coccinea, *Linn.*
पैर	Ficus cordifolia, *Roxb.*
पोकळामिरी	Piper trioicum, *Roxb.*
पोकळा	Amaranthus tristis, *Linn.*
पोटा or पोटचागहुं	Triticum sativum, *Lam.*, var.
पोंडा or पोडाऊंस	Saccharum officinarum, *Linn.*, var.
पोपटी	Physalis peruviana, *Linn.*
पोपणस	Citrus decumana, *Willd.*
पोपय	Carica Papaya, *Linn.*
पोफळी	Areca Catechu, *Linn.*
पोस्त	Papaver somniferum, *Linn.*
फणस	Artocarpus integrifolia, *Linn.*
फणसआंबा	Agaricus ostreatus, *Jacq.*
फणसी or शी	?
फणसुल	Artocarpus hirsuta, *Lamk.*
फलसन	Butea parviflora, *Roxb.*
फळफळा	Acacia odoratissima, *Benth.*
फळशी	Grewia asiatica, *Linn.*
फांगळा	Pogostemon purpuricaulis, *Dalz.*
फांजे or फांजी	A vegetable. Bot. name ?

फांद	Rivea ornata, *Chois.*
फापटी	Oldenlandia corymbosa, *Linn.*
फापरी	A potherb. Bot. name ?
फालसे	Grewia asiatica, *Linn.*
फास	Anogeissus acuminata, *Wall.*
फिंदुक	Filberts, imported from Europe.
फिरंगीधोत्रा	Argemone mexicana, *Linn.*
फुरडी	A flowering tree. Bot. name ?
फुरवांण	Scirpus Kysoor, *Roxb.*
फुलटी	?
फुलदावरी	?
फुलसटी	Woodfordia floribunda, *Salisb.*
फुलिया	Marus rugosus, *Lour.*
बकायण	Melia azedarach, *Linn.*
बकाळी	?
बकी	?
बकुळ or बकुळी	Mimusops Elengi, *Linn.*
बकोरा	Ixora coccinea, *Linn.*
बंगालीपिंपळी	Piper longum, *Linn.*
बचनाब or ग	Aconitum ferox, *Wall.*
बजरबट्टु or बझरबट्टु	Corypha umbraculifera, *Linn.*
बटमोगरा	Jasminum Sambac, *Aiton*, double var.
बटाटा	Solanum tuberosum, *Linn.*
बडाअंतरगंधा	?
बडीअजमादे	Apium graveolens, *Linn.*
बडीमायी	Tamarix gallica, *Linn.* The galls.
बढर	Artocarpus Lakoocha, *Roxb.*
बंदाकपुष्प	Loranthus longiflorus, *Desv.*
बारीकजीरस	Currants, imported from Europe.
बला	Sida cordifolia, *Linn.*
बहुफळी	Corchorus fascicularis, *Lam.*
बांगुली	Calycopteris floribunda, *Lam.*
बाजरी	Pennisetum typhoideum, *Rich.*
बांडगुळ	A name applied to orchids.
बांदळी	Panicum pilosum, or Echinochloa hispidula, *Bomb Flora.*
बादाम	Amygdalus communis, *Linn.*
बादियान	Illicium anisatum, *Linn.*
बादिशान	A corruption of Balesán, Balsam.

बांदें	A name applied to different kinds of Loranthus.
बांधाळें or बांधें	A name applied to orchids.
बानबेरीज	Bougainvillea spectabilis.
बापळी or बाफळी	Peucedanum grande, *C. B. Clarke.*
बांब	Herpestis Monnieria, *H. B. & Kth.*
बांबुना	Matricaria Chamomilla, *Linn.*
बाभुळ	Acacia arabica, *Willd.*
ब्राह्मणी	Colebrookia ternifolia, *Roxb.*
बारामाशीखरबुज	Cucumis Melo *Linn., var.* utilissimus.
बारिकघोळ	Portulaca quadrifida, *Linn.*
बारीकभोवरी	Ipomœa muricata, *Jacq.*
बावच्या	Psoralea corylifolia, *Linn.*
बावा	Cassia Fistula, *Linn.*
बाशिंग	Polypodium quercifolium, *Spr.*
बाहवा or बाळकांटेरी	Cassia Fistula, *Linn.*
बाळतनिंब or बाळलिंब	Melia Azadirachta, *Linn.*
बिंदुकली	A name applied to orchids.
बिबल	Cyperus rotundus, *Linn.*, and other species of Cyperus growing in fields.
बिबला or बिबवी	Semecarpus Anacardium, *Linn. f.*
बिर्वा	Cephalandra indica, *Naud.*
बिंभीतक	Terminalia belerica, *Roxb.*, popularly Semecarpus Anacardium, *Linn. f.*
बिरजातिफ	Corruption of the Persian Biranjasif. Achillœa Santolina, *Stocks.*
बिल or बिल्व	Ægle Marmelos, *Correa.*
बिलंबी	Averrhoa Bilimbi, *Linn.*
बिलवा	Ægle Marmelos, *Correa.*
बिवळा	?
बिहीदाणा	Quince seeds, imported from Persia.
बुईमादेरान	Achillœa Santolina, *Stocks.*
बुगडीवेल	Stephanotis floribunda, *Poir.*
बुटी	Eriochlena Hookerii, *W. & A.*
बुन्दर	Eupatorium divergens, *Roxb.*
बुरंबी	Leucas stelligera, *Wall.*
बुरूंबी	Dysoxylum binectariferum, *Hook. f.*
बुळबुळी	?
बेंडभोवरी	?

बेंडमुष्क	Salix Caprea, *Linn.* The flowers imported from Persia.
बेंदर	Vitis araneosus, *Dalz.*
बेचका	Indigofera cordifolia, *Heyne.*
बेदरी	A fruit tree. Bot. name ?
बेबली	A fruit tree. Bot. name ?
बेलतवस	Butea superba, *Roxb.*
बेलवांगी	Solanum lycopersicum, *Don.*
बैंगुली or बैनगुळी	Loranthus amplexifolius, *W. & A.*
बोई	Dorema Ammoniacum, *Don.* The root imported from Persia.
बोक	Bischoffia javanica, *Bl.*
बोकेडा or बोखेडा	Ficus hispida, *Linn. f.*
बोंडगणगी or बोंडगी	Lagerstræmia lanceolata, *Beddome.*
बोंडगी	Pandanus odoratissimus, *Willd.*
बोंडचोळी	?
बोंडर	Lagerstræmia lanceolata, *Beddome.*
बोंडवेल	Argyreia elliptica, *Don.*
बोर	Zizyphus Jujuba, *Lamk.*
बोरांटी	?
बोऱ्ही	Albizzia odoratissima, *Benth.*
ब्रह्मदंडी	Argemone mexicana, *Linn.*
ब्रह्मयष्टी	Taxus baccata, *Linn.*
ब्रह्मी or ब्राह्मी	Hydrocotyle asiatica, *Linn.*
भंग or भंगा	Cannabis sativa, *Linn.*
भद्राक्ष	Eleocarpus Ganitrus, *Roxb.*
भस्मकंद	Sauromatum pedatum, *Schott.*
भाटजांभुळ	?
भाटवरणा	Cratæva religiosa, *Forst.*
भांडळी	A tree, the wood is used for torches. Bot name ?
भांडीर	Clerodendron infortunatum, *Linn.*
भांत	Oryza sativa, *Linn.*
भांबुरडा or भांबरूड	Blumea, several species.
भामणी or भामिणी	Colebrookia ternifolia, *Roxb.*
भारंग, गा or भारंगमूळ	Clerodendron serratum, *Spr.*, and Siphonanthus, *R. Br.*
भालगांजा	?
भावई	Cassia Fistula, *Linn.*

भिंजरा	Turnera ulmifolia, *Don.*
भिरंड	Garcinia indica, *Chois*
भुईआवळी	Phyllanthus Niruri, *Müll-Arg.*, and urinaria, *Linn.*
भुईकंद	Scilla hyacinthoides, *Linn.*
भुईकोहळी	Ipomœa digitata, *Linn.*
भुईगुळी	Indigofera enneaphylla, *Linn.*
भुईतेरडा	Lepidagathis cristata, *Willd.*
भुईदोरी	Tylophora fasciculata, *Ham.*
भुईपत्र	Taraxacum officinale, *Wiggers.*
भुईमुग	Arachis hypogœa, *Linn.*
भुईसरपटा	Oxalis corniculata, *Linn.*
भुयकोहोळा	Ipomœa digitata, *Linn.*
भुयचांपा	Kæmpferia rotunda, *Linn.*
भुयतरवड	Cassia obovata, *Colladon.*
भुयफोड	Bovista sp ?
भुयमुळा	Raphanus sativus, *Linn.*
भुयरिंगणी	Solanum xanthocarpum, *Schrad.*
भुरगुती	Zizyphus xylopyra *Willd.*
भुरवड	Urostigma dasycarpum, *Miquel.*
भेकल	Flacourtia Ramontchi, *L'Herit.*
भेंड	Æschynomene aspera, *Linn.*
भेर or बोर	Zizyphus Jujuba, *Lamk.*
भेरंड	Garcinia indica, *Chois.*
भेरलामाड	Caryota urens. *Linn.*
भोकर	Cordia Myxa, *Linn.*
भोजपत्र	Betula Bhojpattra, *Wall.*
भोंपळी	A general term for pumpkins.
भोमा	Glochidion lanceolarium, *Dalz.*
भोरंबी	A timber tree. Bot. name ?
भोरसाल	Hymenodictyon excelsum, *Wall.*
भोवरी	Ichnocarpus frutescens, *Br.*
भौरी	Ipomœa muricata, *Jacq.*
भृंगराज	Eclipta alba, *Hassk.*
भृंगा	Cannabis sativa, *Linn.*
मकरासिंग	Caralluma fimbriata, *Wall.*
मका	Mecca corn, or Indian corn, Zea Mays, *Linn.*
मखमल	Tagetes erecta, *Linn.*

मग	Phaseolus Mungo, *Linn.*, var. radiatus, *Linn.*
मगबीर	Anisomeles malabarica, *R. Br.*
मगियामाई	Tamarix gallica, *Linn.*
मचोळ	Anthrocnemum indicum, *Moq.*
मंजिष्ट	Rubia cordifolia, *Linn.*
मठ	Phaseolus aconitifolius, *Jacq.*
मथुरी	Melochia velutina, *Beddome.*
मदनघंटी	Spermacoce hispida, *Linn.*
मदनमस्त	Amorphophallus campanulatus, *Blume.*
मदनी	A tree. Bot. name ?
मयाळ	Basella alba, *Linn.*
मयूरशिखा	Celosia argentea, *Moq.*
मर्जादबेल	Ipomœa biloba, *Forsk.*
मरडीटांकळी	A variety of (Tankli) Cassia Tora, *Linn.*
मरमत	Acacia eburnea, *Willd.*
मर्यादवेल	Ipomœa biloba, *Forsk.*
मरवा	Origanum Majorana, *Linn.*
मरसिंगी	Dolichandrone falcata, *Seem.*
मरेडी	Erigeron asteroides, *Roxb.*
मरढेतीळ	Sesamum indicum, *Linn.* (White flowered.)
मलबारीहळद	Zingiber Cassumunar, *Roxb.*
मशीपत्री	Grangea madraspatana, *Poir.*
मस्तकी	Pistacia cabulica, *Stocks.*
मसाई	Casearia tomentosa, *Roxb.*
मसूर	Ervum Lens, *Linn.*
महातिक्त	Coptis Teeta, *Wall.*
महादेवी	Corallocarpus conocarpa, *Hook. f.* (The fruit is like the Lingam of Mahadeva.)
महानिंब	Melia Azedarach, *Linn.*
महारुख	Ailanthus excelsa, *Roxb.*
महाळुंग	Citrus medica, *Linn.* The Citron.
माईण	?
माकडनिंबोणी	Atalantia monophylla, *Corr.*
माकडशिंगी or माकडशेंगूळ	Caralluma fimbriata, *Wall.*
माका or माकडी	Eclipta alba, *Hassk.*
माचळ	Bauhinia malabarica, *Roxb.*

माजूफळ	Quercus infectoria, *Oliver.*
माझीरीयन	A corruption of Mazariyun, Daphne Mezereum, *Linn.*
माठ	Amaranthus sp., var. used as spinach.
मांड	Colocasia antiquorum, *Schott.* The large kind with long roots, and black petioles.
मातीसुळ	Leonotis nepetifolia, *Don.*
मादगाई	Bambusa arundinacea, *Willd.*
मांदा	Dioscorea triphylla, *Willd.*
मांदार	Calotropis gigantea, *R. Br.*
माधवलठ or माधवी	Hiptage Madablota, *Gærtn.*
मापुरासिक........................	Actinopteris radiata, *Linn.*
मामीरान	Coptis Teeta, *Wall.*
मारगुंझा or मारगुदिया	Eriocaulon sexangulare, *Linn.*
मारजांबळ	?
मारपासपोली	Dioscorea oppositifolia, *Roxb.*
मारवेल........................	?
मारांडी	Acanthus ilicifolius, *Blume.*
मालकांगोणी	Celastrus paniculatus, *Willd.*
मालती	Jasminum grandiflorum, *Linn.*
मालीतुळस	Ocimum gratissimum, *Linn.*
माल्लेअ	Canthium didymum, *Roxb.*
मावरुख........................	Garcinia Morella, *Desrouss.*
माहुली	?
माळविगोखरु	Pedalium Murex, *Linn.*
मिरची	Capsicum annuum, *Linn.*
मिरजोळी	?
मिरवेल	Piper nigrum, *Linn.*
मुंग	Phaseolus Mungo, *Linn.*
मुंगणवेल	Dalbergia volubilis, *Roxb.*
मुंगुसकांदा	?
मुंगुसवेल	Artemisia vulgaris, *Linn.*
मुचकुंद	Pterospermum suberifolum, *Lamk,*
मुंडी	Sphæranthus indicus, *Linn.*
मुर्ताया	Begonia crenata, *Dryander.*
मुदाम	Abutilon graveolens. *W. & A.*
मुल्लीय	Diospyros assimilis, *Bedd.*
मुशकी	Tylophora mollissima, *Wight.*

मुसलीकंद	Hypoxis orchioides, *Gartn.*, and other species.
मुळा	Raphanus sativus, *Linn.*
मेकी	?
मेढाशिंगी	Gymnema sylvestre, *R. Br.* and Dolichandrone falcata, *Seem.*
मेथी	Trigonella Fœnum-Græcum, *Linn.*
मेंदी	Lawsonia alba, *Lam.*
मेधीअंवळी	Cassia obovata, *Colladon.*
मेरशिंगी	Spathodea falcata, *Wall.*
मोकडी	Schrebera Swietenioides, *Roxb.*
मोगरा	Jasminum Sambac, *Aiton.*
मोगली एरंड	Jatropha Curcas, *Linn.*
मोच	A vegetable. Bot. name ?
मोठाकरमळ	Dillenia indica, *Linn.*
मोठाताग	Crotalaria juncea, *Linn.*
मोठातवीर	Garcinia xanthochymus, *Hook. f.*
मोठालसुरा	Cordia latifolia, *Roxb.*
मोठावेलदोडा	Amomum subulatum, *Roxb.*
मोठीघोळ	Portulaca oleracea, *Linn.*
मोठीपिंपळी	Piper longum, *Linn.*
मोडा	Casearia graveolens, *Dalz.*
मोतयेन	Lepidagathis grandiflora, *Dalz.*
मोतारिंगणी	Solanum trilobatum, *Linn.*
मोथा	Cyperus rotundus, *Linn.*
मोय	Odina Wodier, *Roxb.*
मोरण्णा	Acanthus ilicifolius, *Blume.*
मोरवेल	Clematis triloba, *Heyne.*
मोरशिखा	Celosia cristata, *Roxb.*
मोरस	Suæda nudiflora, *Moq.*
मोसंबीचणा	Voandseia subterranea.
मोहरी	Brassica juncea, *H. f. & T.*
म्हैसवेल	Habenaria sp. ?
येकली	Gymnosporia Rothiana, *W. & A.*
येंकुळ	Gymnosporia emarginata, *Roth.*
येरूळ	Xylia dolabriformis, *Benth.*
येवती	Hippocratia Grahami, *Wight.*
येला	Terminalia belerica, *Roxb.*
रंगारी हिरडा	Terminalia Chebula, *Retz.*

रंगेरा	Cylista scariosa, *Ait.*
रतकूर	Glycosmis pentaphylla, *Corr.*
रतनजोत	Alkanet, Arnebia, sp. ? from Cabul.
रतनवेल	Ipomœa Batatas, *Lamk.*
रतांबी	Garcinia indica, *Choiss.*
रताळी	Ipomœa Batatas, *Lamk.*
रवासीन	Sesbania ægyptica, *Pers.*
रसवाळी	A var. of Plantain, Musa paradisiaca, *Linn.*
रसोत or रसवंती	Extract of Berberis Lycium, *Royle.*
राई	Brassica, several species yeilding mustard.
रागी	Mezoneurum cucullatum, *W. & A.*
राघुकेत	?
राजकेळ	A var. of Plantain, Musa paradisiaca, *Linn.*
राजगिरी	Celosia cristata, *Linn.*, a wild green variety.
राजजिरें	Corchorus trilocularis, *Linn.*
राजंण	Mimusops hexandra, *Roxb.*
राजतुरा	A flower tree, Bot. name ?
राजहंस	Adiantum venustum, *Don.*
राजाळू	Colocasia antiquorum, *Schott.* A white var.
रातंजन	Pterocarpus santalinus, *Linn. f.*
रातंबीर	Garcinia indica, *Chois.*
रानअंबा	Spondias mangifera. *Pers.*
रानअबोली	Justicia Ecbolium, *Linn.*
रानकांदळ	?
रानकोंथिंबीर	?
रानगांज्या	?
रानघेवडा	Cylista scariosa, *Ait.*
रानघोळ	Portulaca quadrifida, *Linn.*
रानजाई	Clerodendron inerme, *R. Br.*
रानजायफळ	Myristica malabarica, *Lamk.*
रानटाकळी	Cassia occidentalis, *Linn.*
रानतरवड	Cassia auriculata, *Linn.*
रानातिळी	Sesamum indicum,*Linn.*
रानतोंडली	Cephalandra indica, *Naud.* Wild var.

रानदारचिनी	Cinnamomum iners, *Rwdt.*
रानदोडकी	Luffa acutangula, *Roxb.*, var. amara.
रानपडवळी	Trichosanthes cucumerina, *Linn.*
रानपिंपळ	Thespesia populnea, *Corr.*
रानपोपटी	Physalis indica, *Lam.*
रानबाजरी	Typha angustifolia, *Linn.*
रानभेंडीचें झाड	Thespesia lampas, *Dalz.*
रानमसूर	?
रानमूग	Phaseolus sp. ?
रानमोगरा	Jasminum angustifolium, *Roxb.*
रानशेंगट	Moringa concanensis, *Nimmo.*
रानशेर	Periploca aphylla, *Dcne.*
रानशेवती	?
रानशेवरी	Sesbania aculeata, *Pers.*, and S. procumbens, *W. & A.*
रानसवा	Panicum colonum, *Linn.*
रानहळद	Curcuma aromatica, *Salisb.*
रानावळी	?
रानाळू	Colocasia antiquorum, *Schott.* Wild var.
रामतीळ	Guizotia oleifera, *DC.*
रामतुरई	Hibiscus esculentus, *Linn.*
रामतुळस or रामदुती	Ocimum gratissimum, *Linn*
रामपत्री	The mace of Myristica malabarica, *Lam.*
रामफळ	Anona reticulata, *Linn.*
रामबाण	Typha angustifolia, *Linn.*
रामबाभळ	Acacia arabica, *Willd.* var.
राममंदार	Calotropis gigantea, *R. Br.*
रामला	Cratæva religiosa, *Forst.*
रामाठा or रामेठा	Lasiosiphon speciosus, *Dcne.*
रायआंवळा	Cicca disticha, *Willd.*
रायकुरा or कुरी	Ixora parviflora, *Vahl.*
रायघोळ	Portulaca quadrifida, *Linn.*
रायणी	Mimusops hexandra, *Roxb.*
रायदिंडा	Leea crispa, *Willd.*
रायबोर	Zizyphus Jujuba, *Lamk.*, small var.
रायमुनी	?
रायशेवती	Chrysanthemum indicum, *Linn.*
राष्णा or रास्ना	Acampe papillosa, *Lindl.*
राळ	Resin of Shorea robusta, *Gærtn.*

रिंगणी	Solanum indicum, *Linn.*
रिंगणवेल	Solanum xanthocarpum, *Schrad.*
रिठा	Sapindus trifoliatus, *Linn.*
रिषेखितमी	A corruption of Persian *Risha-i-Khitmi*, Althæa officinalis, *Linn.*
रुई or रुईटी	Calotropis gigantea, *R. Br.*
रुईण	Soymida febrifuga, *Adr. Juss.*
रुखा	Antiaris toxicaria, *Leesch.*
रुद्राक्ष	Elœocarpus Ganitrus, *Roxb.*
रुमीमस्तकी	Gum Mastiche. Pistacia Lentiscus, *Linn.*
रुहई	Soymida febrifuga, *Adr. Juss.*
रुक्षांग	A parasitic plant. Bot. name ?
रेडेकोलती	?
रेडेधाऊस	?
रेणूकवी	Vitex Agnus castus, *Linn.*
रेवनखताई	Rhubarb. Rheum sp.
रोजमरी	Achillea millefolium, *Linn.*
रोटी or रोठी	Malva sylvestris, *Linn.*
रोशगवत or रोहिष	Andropogon Schœnanthus, *Linn.*
लंकाशेज	Euphorbia Tirucalli, *Linn.*
लघुमुजगवत	A grass. Bot. name ?
लज्जालू, लाजरी or लाजाळू	Mimosa pudica, *Linn.*
लनूटक्	Erythrœa Roxburghii, *G. Don.*
लवंग	Caryophyllus aromaticus, *Linn.*
लव	?
लवाळा or लव्हाळा	Eng. Rush, usually applied to Scirpus subulatus, *Vahl.*, and Cyperus pertenuis, *Roxb.*
लसूण, लहसन or लशुन	Allium sativum, *Linn.*
लहानकल्प	Portulaca quadrifida, *Linn.*
लहानगोखरू	Tribulus terrestris, *Linn.*
लहानबोंडर	Lagerstræmia parviflora, *Hook.*
लाकेरी	?
लाज्री	Mimosa pudica, *Linn,*
लामतानी	Anodendron paniculatum, *DC.*
लायंजा	Casearia tomentosa, *Roxb.*
लालअंबाडी	Hibiscus Sabdariffa, *Linn.*
लालआघाडा	Plectranthus cordifolius, *Don.* ?
लालकवंडळ	Trichosanthes palmata, *Roxb.*

लालकुवार	Tradescantia discolor, *Willd.*
लालखैर	Acacia Sundra, *DC.*
लालचमेली	Quisqualis indica, *Linn.*
लालचित्रक	Plumbago coccinea, *Boiss.*
लालझाऊ	Tamarix dioica, *Roxb.*
लालभुईआवळी	Phyllanthus urinaria, *Linn.*
लालमयाळ	Basella rubra, *Linn.*
लालमांदार	Calotropis procera, *R. Br.*
लालमिरची	Capsicum annuum, *Linn.*
लालमुद्रिका	Papaver Rhæas, *Linn.*
लावसट	Mussænda frondosa, *Linn.*
लिंगी	?
लिंबीण	Citrus acida, *Linn.*
लिंबीदिवी	Cæsalpinia Coriaria, *Willd.* American Divi-divi.
लुंगर	Ficus sp.? Graham's Catalogue No. 1376.
लुलाई	Albizzia amara, *Boivin.*
लेची	Nephelium Litchi, *Camb.*
लेंडीपिंपळी	Piper sp. ?
लेनजा	Casearea tomentosa, *Roxb.*
लोखंडी झाड or लोखंडी	Ixora parviflora, *Vahl.*
लोत	Sauromatum pedatum, *Schott.*
लोद or लोध	Symplocos racemosa, *Roxb.*
लोवी	Artocarpus Lakoocha, *Roxb.*
वचवेखंड	Acorus Calamus, *Linn.*
वज्रदंती	Barleria prionitis, *Linn.*
वज्रमूठ	Synantherias sylvatica, *Schott.*
वटवेल	Cocculus macrocarpus, *W. & A.*
वड (वट)	Ficus bengalensis, *Linn.*
वत्सनाभ	Aconitum ferox, *Wall.*; also Lagenandra toxicaria, *Dalz.*
वनजाई	Clerodendron inerme, *R. Br.*
वनभेंडा	Urena lobata, *Linn.*
वनमेथिका	Melilotus sp. ?
वनहारिद्रा	Curcuma aromatica, *Salisb.* C. Zedoaria, *Roxb.*
वरधारा	Rourea santaloides, *W. & A.*
वर्याळी	Fœniculum vulgare, *Gärt.*
वरस	Heterophragma Roxburghii, *DC.*

वरीवल	Coix barbata, *Roxb.*
वरिसावा	Panicum miliaceum, *Linn.*
वसनवेल	Cocculus villosus, *D. C.*
वाकुंभा	Careya arborea, *Roxb.*
वांकेरी	Cæsalpinia digyna, *Rottl.*
वाखंडी	Gymnema sylvestre, *R. Br.*
वागचवडा or वागराटी	Costus speciosus, *Sm.*
वांगी or वायंगी, (वृंताक)	Solanum melongena, *Linn.*
वाघचबका	Gloriosa superba, *Linn.*
वाघंटी	Capparis zeylanica, *Linn.*
वाघनखी	?
वांझकरंटोळीमूळ	Momordica dioica, *Roxb.*
वाटोळी	Anamirta cocculus, *W. & A.*
वातवेल	Cocculus macrocarpus, *W. & A.*
वांदररोटी	Notonia grandiflora, *D. C.*
वांदा	Loranthus sp. var.
वानीर	Withania coagulans, *Dunal.*
वांप्पी	Cookia punctata, *W. & A.*
वांब	Nephelium Longana, *Camb.*
वायकुंभा	Careya arborea, *Roxb.*
वायटी	Ruellia imbricata, Graham's Catalogue, No. 1195.
वायवरणा (वरुण)	Cratæva religiosa, *Forst.*
वारंग or वारगड	Kydia calycina, *Roxb.*
वारवा	Dolichos Lablab, *Linn.*
वारस	Heterophragma Roxburghii, *DC.*
वाराही	Dioscorea sativa, *Willd.*
वारेळूं	Andropogon muricatus, *Retz.*
वाल	Adenanthera pavonina, *Linn.*
वालकफा	Dombeya tomentosa, *DC.*
वालपापडी	Dolichos Lablab, *Linn.*
वालवांगी	Lycopersicum esculentum, *Miller.*
वालुंज	Salix tetrasperma, *Roxb.*
वावडिंग or वावडंग	Embelia ribes, *Burm.*
वावबाव	Adansonia digitata, *Linn.*
वावळा	Ulmus integrifolia, *Roxb.*
वासनवेल	Cocculus villosus, *DC.*
वासा	Vitis Rheedii, *W. & A.*
वाळ	Adenanthera pavonina, *Linn.* The seeds.

वाळा	Andropgon muricatus, *Retz.*
वाळुंज, or वाळुंजीचें झाड	Salix tetrasperma, *Roxb.*
विखमोगरी	Jasminum pubescens, *Willd.*
विखारी	Callicarpa cana, *Linn.*
विरणा	?
विलायतीडकसी	Petrea volubilis, *Jacq.*
विलायतीचिंच	Inga dulcis, *Roxb.*
विलायतीझीरा	Carum Carui, *Linn.*
विलायतीपिंपळ	Sapium sebiferum, *Roxb.*
विलायतीफणस	Artocarpus incisa, *Linn.*
विलायतीसरो	Casuarina equisetifolia, *Forster.*
विलायतीसालस	Smilax officinalis, *Humb. and Bonpl.*
विषारी or विष्णुक्रांता	Ipomœa Quamoclit, *Roxb.*
वेखंड	Acorus Calamus, *Linn.*
वेत	Calamus rotang, *Linn.*
वेणीवेल	Cissampelos Pareira, *Linn.*
वेलगोंड	A vegetable, Basella alba vel rubra, *Linn.*
वेलदोडे	Elettaria Cardamomum, *Maton.*
वेलबोंडी	Basella alba vel rubra, *Linn.*
वेलमिरची	A variety of Capsicum.
वेलवांगी	Lycopersicum esculentum, *Miller.*
वेह्कळी	Pittosporum floribundum, *W. & A.*
वेळ	Basella alba vel rubra, *Linn.*
वेळू	Bambusa arundinacea. *Retz.*
वैजयंती	Sesbania ægyptiaca, *Pers.*
वोतंबा	Artocarpus Lakoocha, *Roxb.*
शंकासूर	Cæsalpinia pulcherrima, *Swartz.*
शंकेश्वर	Xanthium strumarium, *Linn.*
शंखवेली	Evolvulus hirsutus, *Lam.*
शतमुळी or शतावरी	Asparagus racemosus, *Willd.*
शमडा	Prosopis spicigera, *Linn.*
शमी	Acacia Suma, *Kurz.*
शमींरीदा	Eriodendron aufractuosum, *DC.*
शर्मी	?
शहाजिरें	Carum nigrum, *Roxb.*
शहातूत	Morus indica, *Linn.*
शातरा	Fumaria officinalis, *Linn.*
शामराज	Shorea robusta, *Gärtn.*

शार्दूल	Terminalia Arjuna, *Bedd.*
शाल or शालपर्णी	Desmodium gangeticum, *DC.*
शाळू	Holcus cernuus.
शिका or शिकाकाई	Acacia concinna, *DC.*
शिंकणी (शिंक)	Centipeda orbicularis, *Lour.*
शिंगाडा	Trapa bispinosa, *Roxb.*
शिंडी	Odina Wodier, *Roxb.*
शिडंब	?
शितागौर (सांतागौरी) शिताचंवरी.	Asparagus racemosus, *Willd.*
शिताफळ	Anona squamosa, *Linn.*
शिंद	Phœnix sylvestris, *Roxb.*
शिंदळवान or नी	Curcuma pseudomontana, *Grah.*
शिमटी	Odina Wodier, *Roxb.*
शिरघोसाळी	Luffa acutangula, *Roxb.*
शिदौंडी	Holostemma Rheedii, *Wall.*
शिरस	Brassica campestris, *Linn.*
शिरळ or शिरळा	Grewia Microcos, *Linn.*
शिरळी	Luffa acutangula, *Roxb.*
शिवणी	Gmelina arborea, *Roxb.*
शिवरडोळी	Mussænda frondosa, *Linn.*
शिवलिंग	Corallocarpus canocarpa, *H. f.* So named from its resemblance to the Lingam.
शिवळी	Nyctanthes Arbor-tristis, *Linn.*
शिंशपा or सीशु	Dalbergia Sissoo, *Roxb.*
शुकाई	Emex species, imported from Persia.
शेगट or शेगवा	Moringa pterygosperma *Gärtn.*
शेंड	Euphorbia tithymaloides, *Willd.*
शेंडवेल	Dioscorea pentaphylla, *Willd.*
शेतकापशी	Gossypium herbaceum, *Linn.*
शेतवड or शेताड	Ipomœa Turpethum, *Br.*
शेतवाळूक	A kind of Cucumber.
शेंदणी, शेंदवली or शेंदाड	A kind of Melon.
शेंदरी	Mallotus philippensis, *Müll.*
शेण्याखैर	Acacia Catechu, *Willd.*, var.
शेपु	Anethum Sowa, *Kurz.*
शेंबरटी or शेंबा	?
शेमटी	Odina Wodier, *Roxb.*
शेर	Euphorbia Tirucalli, *Linn.*
शेरणी	Thevetia neriifolia, *Juss.*

शलवटा or टौ	Cordia Myxa, *Linn.* Also a creeper common in the Concan.
शेलाटी	A tree. Bot. name ?
शेलू	Cordia latifolia, *Roxb.*
शेव or शेवीचें झाड	A fruit tree, Bot. name ?
शेवती	Chrysanthemum indicum, *Linn.*
शेवला	Pythonium Wallichianum, *Schott.*
शेवरी	Sesbania ægyptiaca, *Pers.*
शेवाळ	All kinds of pond weed.
शेस्ती	Meriandra bengalensis, *Benth.*
शोभांजन	Moringa pterygosperma, *Gärtn.*
शोफा	Fœniculum vulgare, *Gärtn.*
श्रावड	A shrub, The silvery leaves are offered by women to Mangalgor in the month of Shrawan.
संकेश्वर or शंकासूर	Cæsalpinia pulcherrima, *Swartz.*
सणबीज	Crotalaria juncea, *Linn.*
सजगुरा	Pennisetum typhoideum, *Rich.*
सर्ड्यांचामाड	Tacca pinnatifida, *Forsk.*
सताप or सतापाचें झाड	Ruta augustifolia, *Pers.*
सदागुलाब	Rosa glandulifera, *Roxb.*
सदाफूल	Vinca rosea, *Roxb.*
संदेसरा	Cæsalpinia pulcherrima, *Swartz.*
संध्याकाळी	Mirabilis Jalapa, *Linn.*
संनिपात	Antirrhinum glaucum, *Linn*
सप्तपर्ण or सातविण	Alstonia scholaris, *R. Br.*
सपिस्तान	Sebesten plums, see Cordia.
सफेतजिरें	Cuminum Cyminum, *Linn.*
सफेतमधाचें झाड	Flüggea leucopyrus, *Willd.*
सफेतमुसळी	Asparagus adscendens, *Roxb.*
सफेतसांवर	Bombax malabaricum, *DC.*
सफेततोंदडी	Lepidium Iberis, *Linn.*
सफेतपाडळ	?
सबजा	Ocimum Basilicum, *Linn.*
संभालू	Vitex sp ?
समुद्रफल or ळ	Barringtonia acutangula, *Gärtn.*
समुद्रशोक-शोष-सोक	Argyreia speciosa, *Sweet.*
सरपून	Callophyllum tomentosum, *Wight.*
सरफुंखा	Tephrosia purpurea, *Pers.*

सरमल	?
सरांटा or सराटे	Tribulus terrestris, *Linn.*
सरू	The Cypress of gardens, Cupressus glauca, *Spr.*
सरू (विलायती)	Casuarina muricata, *Roxb.*
सर्पककाली	?
सर्वौषधि	?
सलगम	The turnip, Brassica Rapa, *Linn.*
सलाई or सालफळी	Boswellia serrata, *Roxb.*
सहदेवी	Sida rhomboidea, *Roxb.*
साखरजांब or भ	Eugenia Jambos, *Linn.*
साखरनिंबू	Citrus medica, *Linn.*, var. Sweet Lime.
साखवेल	Canscora decussata, *Don.*
साग	Tectona grandis, *Linn.*
सागरगोटी	Cæsalpinia Bonducella, *Roxb.*
सागाई	?
सागू	Cycas circinalis, *Roxb.*
साजिरा or साजेरी	Sageræa laurina, *Dalz.*
सातर	Zataria multiflora, *Boiss.*
साधीमंदी	Emilia sonchifolia, *DC.*
सापसंद or ध	Aristolochia indica, *Linn.*
सांबरभोंपळी	?
सायंकाळी	?
सायरी	A tree which yields the oil सामरल
सायली	Jasminum officinale, *Linn.*
सारडूळ	?
साल	Shorea robusta, *Gärtn.*
सालफळी	Boswellia serrata, *Roxb.*
सालभेंडी	?
सालंमिश्री	Salep from Orchis roots of various species.
सालवण	Desmodium gangeticum, *DC.*
सालोरी	Hemidesmus indicus, *R. Br.*
सांवर	Bombax malabaricum, *DC.*
सांवरचिनें	Jatropha Manihot, *Willd.*
साळवणी	Desmodium gangeticum, *DC.*
साळी	Boswellia serrata, *Roxb.*
सिआहझीरा	Carum nigrum, a var. of C. Carui, *Linn.*

सिगमकाटी	Dichrostachys cinerea, *W. & A.*
सितळचिनीं	Eugenia acris, *W. & A.?*
सिंदरबर	Curcuma pseudomontana, *Grah.*
सिदोडी	Holostemma Rheedii, *Wall.*
सिमाक	Fruit of Rhus coriaria, *Linn.*, imported.
सिमार	Cordia Myxa, *Linn.*
सिरीद	Hymenodictyon thyrsiflorum, *Wall.*
सीरेबरी	Muscat Garlic, imported. Bot. name ?
सिरपून	Calophyllum tomentosum, *Wight.*
सुकाई	Emex sp. ? imported.
सुकुत्या	Lagerstrœmia lanceolata, *Bedd.*
सुखतोदडी	Lepidium Iberis, *Linn.*
सुगरीण	?
सुंठ	Dry ginger. Zingiber officinale, *Roscoe.*
सुंदर	Connarus monocarpus, *Linn.*
सुदाब	Ruta angustifolia, *Pers.*
सुना	Cassia lanceolata, *Forsk.*
सूनकी	Wedelia biflora, *DC.*
सूकनू	Cerbera Odollam, *Gärtn.*
सूंडिया	Holcus cernuus.
सुपली	Clitorea Ternatea, *Linn.*
सुपारी	Areca Catechu, *Linn.*
सूपी or सूती	Mundulea suberosa, *Benth.*
सूमाक	Rhus coriaria, *Linn.*
सुरंग or सुरंगी	Ochrocarpus longifolius *Benth, & Hook, f.*
सुरण (सूरण)	Amorphophallus campanulatus, *Blume.*
सुरतीभुईतरवड	Cassia obovata, *Colladon,*
सुरबंद	Artemisia vulgaris, *Linn.*, var. indica.
सुरमाड	Tacca pinnatifida, *Forsk.*
सुरिंजन	Hermoodactyls, imported.
सुर्पण	?
सूर्यकमल or ळ	Helianthus annuus, *Linn.* Heliotropium indicum, *Linn.*
सूऱ्या	Xylia dolabriformis, *Benth.*
सूर्यकांत	Helianthus annuus, *Linn.*
सूर्यवल्ली or सूर्यलता	Cleome viscosa, *Linn.*
सूर्यावर्त	Croton plicatum, *Roxb.*
सुवर्णक्षीरी	Cleome felina, *Linn. f.*
सेतु	Morus indica, *Linn.*

सोकोत्रीएळिया	Aloe Perryi, *Baker.*
सोनकेतक or की	Pandanus odoratissimus, *Linn.*
सोनकेळ	Musa paradisiaca, *Linn.* Small yellow var.
सोनचांपा or फा	Michelia Champaca, *Linn.*
सोनजुंइ	Jasminum aureum, *Don.*
सोनटका or का	Hedychium flavum, *Roxb.*
सोनतरवड	Cæsalpinia pulcherrima, *Swartz.*
सोनवळा	?
सोनामुखी	Cassia lanceolata, *Forsk.*, from Swarnamukhi ?
सोनारवेल	?
सोमलता, सोमवेल or सोमा	Sarcostemma brevistigma, *Wight & A.*
सोली or सोल्या	Hedychium coronarium, *Roxb.*
सोवा	Peucedanum graveolens, *Benth.*
सैयारा	Bauhinia racemosa, *Lam.*
सौंदड	Acacia Suma, *Kurz.*
सौबरी or सौवीर	Zizyphus Jujuba, *Lamk.*
हजारदाणा or हदगा	Euphorbia thymifolia, *Burm.*
हडकी	Rauwolfia serpentina, *Benth.*
हडसण	?
हडी	Lonicera Leschenaultii, *Wall.*
हर्कंय	Rauwolfia serpentina, *Benth.*
हरडी	Terminalia Chebula, *Retz.*
हरदानागवेल	?
हरणदोडी or अंब्री	Hoya viridiflora, *R. Br.*
हरणवेल	Pœderia fœtida, *Linn.*
हरदुली	Olax scandens, *Roxb.*
हरभरा	Cicer arietinum, *Linn.*
हर्मल	Peganum Harmala, *Linn.*
हरयेळी or हरळ	Cynodon Dactylon, *Pers.*
हरानी	Dalbergia lanceolaria, *Linn.*
हरिक	Paspalum scrobiculatum, *Linn.*, var. Kodrookora, *Roxb.*
हरिचंदन	Santalum album, *Linn.*
हरितालिका	Cynodon Dactylon, *Pers.*
हरिद्रा or हळद	Curcuma longa, *Rcxb.*
हसोळें	?
हळदवेल	Heptage Madablota, *Gärtn.*

हाडवर्णी	Cratæva religiosa, *Forst.*
हाडशिंगारी or हाडसांधन........	Vitis quadrangularis, *Wall.*
हाशा	?
हिकलबीज........................	Cassia occidentalis, *Linn.*
हिंगण or हिंगणबेट..............	Balanites Roxburghii, *Planch.*
हिंगु	Ferula alliacea, *Boiss.*
हिंताल	Bergia verticillata, *Willd.*
हिंदीअगर	Aquilaria Agallocha, *Roxb.*
हिरगुंदीकापूस.................. ...	Gossypium Stocksii, *Mast.*
हिरडा (हरतकी).....................	Terminalia Chebula, *Retz.*
हिरणदोडी........................	Dregea volubilis, *Benth.*
हिरण्यशाक	Smilax ovalifolia, *Roxb.*
हिरवाएरंड........................	Ricinus communis, *Linn.* The green var.
हिरवातमाखु	A cant term for Ganja, Cannabis sativa, *Linn.*
हिरादखन	Dragon's blood resin from Calamus Draco, *Willd.*
हिरोळी........................	A creeper with an esculent root. Bot. name ?
हिंवर	Acacia tomentosa, *Willd.*
हुणी........................	Pterocarpus Marsupium, *Roxb.*
हुरशी	?
हुरा	Euphorbia Tirucalli *Linn.*
हुलगिरी	Holigarna longifolia, *Roxb.*
हूम	Polyalthia cerasoides, *Benth. & H. f.*
हूमली	Peganum Harmala, *Linn.* ?
हेडसरी	?
हेद	Nauclea cordifolia, *Roxb.*
हेमजविंती	?
हैसूरी	?
होंडी........................	Sorgham vulgare, *Pers.* var.
क्षीरकांकोली	A bulb. Bot. name ?

INDEX.

Aachin 508
Aat-alaria 659
Abies Webbiana 760
Abini 39
Abir 780.
Abkari opium 46
Abnus 485
Abric acid 228
Abrin 228
Abroma augusta 114
Abrong or Abrugi 188
Abrus precatorius 223
Absinthin 436
Abu-kalsa 574
Abushaheri Hing 385
Abutilon indicum 100
Acacia arabica 280, 282
,, Catechu 281, 283
,, concinna 286
,, Farnesiana 281
,, leucophlæa 281
,, pennata 285
,, senegal 281
,, several species 277
Acalypha ciliata 716
,, fruticosa 716
,, indica 714
Acampe papillosa 792
Acanthaceæ 582
Acanthus ilicifolius 590
Acanthodium spicatum 593
Ach 401
Acha 287
Achchhuka 401
Achillein 429
Achillœa millefolium 428
,, santolina 429
Achras Sapota 482
Achrosine 263
Achyranthes aspera 651
,, lanata 653
Acid abric 228
,, ailantic 145
,, anacardic 200
,, anisic 783
,, arabic 279
,, arachic 248
,, benzoic 488
,, capric 65
,, carbolic 470
,, chebulinic 320
,, chrysophanic 261
,, citric 138
,, columbic 26
,, crotonoleic 687
,, cubebic 727
,, eugenic 330
,, euphorbic 692
,, fumaric 53
,, gallic 730
,, gardenic 413
,, gynocardic 70
,, hennotannic 308
,, hyoscinic 632
,, hypogæic 247
,, jatrophic 697
,, linoleic 118
,, margosic 170
,, moringo-tannic 208
,, ophelic 539
,, punico-tannic 311
,, tannic 730
,, thymic 366
,, tiglinic 687
,, viburnic 603
,, violenic 66
Aconine 5
Aconite 1

Aconitine 3, 5
Aconitum ferox 1
　„ heterophyllum 6
　„ Napellus 6
　„ species 9
　„ variegatum 13
Acorin 815
Acorus Calamus 813
Actinodaphne lanceolata 671
Actinopteris dichotoma 862
Ada 762
Adaca Manier 426
Adansonia digitata 107
Adansonine 108
Adatodai 584
Aden aloes 826
Adhatoda Vasica 584
Adiantum lunulatum 861
　„ venustum 861
Adityabhakta 61
Adivigoranta 892
Adrak 762
Adulsa 584
Ægle Marmelos 139
Ærua lanata 653
Æsculetin 405
Æsculin 405
Afikun 629
Afîm 39
Afimedun 876
Afiyun 39
Afsantin 435, 436,
Afsantin-el-bahr 438
Afsharniki 657
Aftimun 569
Agar 674
Agaragar 868
Agardhak 289
Agaric 865
Agaricin 865
Agaricus ostreatus 868
Agarikon 865
Agasta 253
Agati 253
　„ grandiflora 253
Ageratum conyzoides 430
Agetha 604
Aghalukhi 675
Aghada 651
Aghlitus 878
Aginbuti 304
Agintumba 427
Agiya 304
Agnimantha 604
Aguis 600
Agnisikha 832
Agresto 184
Agrimony 543
Ag'ru 674
Aguru 675
Ahliva 56
Ahlot 675
Ahiphena 39
Ahugaha 402
Ailantic acid 145
Ailantus excelsa 144
　„ malabarica 145
Ain 322
Ain-ed-dik 223
Airan 599
Airwan mairawan 359
Aisar 605
Aivanam 307
Ajamoda 378
Ajanphal 880
Ajganda 608
Ajmud 378
Ajowan 365
Ajwain or Ajwan 365
Ajwain-ka-phul 367
Ak 512
Akakalis 267
Akakia 277, 281
Akalbar 355
Akanadi 29
Akanda 512

Akarkara 434, 444
Akarakarabha 444
Akarkarha 445
Akasavalli 672
Akas-gaddah 353
Akasha-garudan 353
Akaswel 569, 672
Akitmakit 249
Akkirakaram 444
Akola 399
Akra 512
Akrabi 442
Akraniki 657
Akri 645
Akrot 713
Akusaliyun 371
Akyan 675
Al 401
Alabu 349
Ala-maram 745
Alangium decapetalum 399
„ hexapetalum 399
„ Lamarckii 399
„ tomentosum 399
Alari 500
Alarka 512
Albizzia amara 287
Alei 237
Alen 762
Aleurites moluccana 712
Aleurone 705
Algæ 868
Algoul 218
Alhagi maurorum 218
Al-haju 218
Alishi 116
Alkanet 573
Alkanna tinctoria 574
Alkusi 229
Allamanda cathartica 507
Alli 747
Allium sativum 841
Almirao 461
Almonds 292
Aloe abyssinica 823
„ Perryi 825
Aloes Aden 826
„ Jafarabad 825
„ Socotrine 825
„ Yamani or Moka 826
„ Zanzibar 825
„ wood 674
Aloexylon Agellochum 674, 676
Aloin 827
Alpam 681
Alphajan 618
Alpinia Galanga 777
„ officinarum 774
Alpinin 776
Alpogada-pazham 294
Alsi 116
Alsi-virai 116
Alstonia scholaris 491
Althæa officinalis 96
Althee of Goa 97
Alti 287.
Altingia excelsa 314
Alu 817
Alubalu 296
Alu-Bokhara 294
Alu-bu-Ali 296
Alui 582
Am 196
Amala 700
Amalaki 700
Amamun or Amuman 877
Amanakkam-chedi 704
Amaltas 258
Amarantaceæ 651
Amarantus spinosus 652
Amarbeli 672
Amaryllideæ 818
Amaut 197
Amaut-mul 346
Amb 196
Amba 196

Ambabatha 196
Ambada 205
Ambapoli 197
Ambaj 196
Ambari 104
Ambashta 29
Ambal 37
Amberbed 615
Ambehaldi 769
Ambosi 197
Ambuprasada 532
Ambuti 121
Amchur 197
Amica nocturna 832
Amkhushk 197
Am-ki-chhitta 197
Amkulang 644
Amlaj 700
Amlaki 700
Amlalonika 121
Amli 270
Amlika 270
Ammannia baccifera 304
  „ vesicatoria 304
Ammoniacum 392
Ammoniakun 393
Amomum 786
  „ Korarima 884
  „ subulatum 788
  „ zanthoides 788
Amorphophallus campanulatus 815
Ampelideæ 182
Ampelosicyos scandens 349
Amra 196, 205
Amras 197
Amrat 206
Amrit-yel 30
Amrulsak 121
Amsul 78
Amygdalus communis 292
Anab-eth-thalib 638
Anacardiaceæ 191
Anacardic acid 200
Anacardium occidentale 198
Anacyclus Pyrethrum 444
Anai-nerunji 553
Anamirta cocculus 27
Anamirtin 29
Ana-Mullu 237
Anantamul 509
Anar 309
Anaryat-tikta 537
Anashovadi 423
Anasphal 22
Anastatica Hierochuntina 54
Anchanchak or Anjukak 879
Anchusa tinctoria 574
Anchusin 574
Andrographis paniculata 582
  „ echioides 583
Andropogon citratus 852
  „ laniger 850
  „ muricatus 851
  „ Nardus 853
  „ Schœnanthus 847
Anethene 374
Anethol 373, 377
Anethum graveolens 374
Angalepan 418
Anghuzeh 382
  „ -i-khalis 382
  „ -i-Lari 386
Angodvartan 418
Angudan 389
Angul-drakh 185
Angur 184
Angusht gandeh 389
Anguzd 389
Anise 377
Anisochilus carnosus 609
Anisomeles malabarica 610
Anitun 374
Anjana or Anjan 287, 325
Anjir 745
Anjubar-i-Rumi 877
Anjudan 389

Anjurah 593
Anjusa 573
Ankota 399
Ankul 399
Anna-shuppu 22
Annatto 73
Anogeissus latifolia 324
Anonaceæ 24
Anona squamoza 24
Antamul 519
Anthemis nobilis 447
Anthocephalus Cadamba 409
Antiarin 747
Antiar-resin 747
Antiaris toxicaria 747
Antila 11
Antirrhinum glaucum 580
Antomul 519
Anvula 700
Anzerut 288
Aod, *see* Ud.
Aod-el-salib 17
Apamarga 651
Apang 651
Aparajita 235
Aphim 39
Apiin 371
Apiol 372
Apium graveolens 370
  „ involucratum 378
Aplotaxis auriculata 451
Apocynaceæ 491
Appakovay 355
Appel 604
Appo 39
Aquilaira Agallocha 674
Arabian myrrh 155
Arabin 279
Arachis hypogæa 246
Aragbadha 258
Aragbadhadi 258
Arak 624
Aralu 547
Arandi 704
Aranmaran 359
Arasammaram 743
Arbor ligni colubrini 533
Ardraka 762
Areca Catechu 802
Argemone mexicana 50
Argol 184
Argyreia speciosa 566
Arisa 486
Aristolochia bracteata 679
  „ indica 677
  „ longa 681
  „ rotunda 680
Aristolochiaceæ 677
Arittamunjayrie 714
Arjalun 878
Arjun 323
Arjikan 14
Arjuna 323
Arka 512
Arkamula 678
Arka-taila 513
Arkan 307
Ark-i-badian 373
Arlu 547
Arnebia sp. 574
Arni 604
Aroideæ 811
Arrowroot, East Indian 768
Arsaghna 816
Artemisia Abrotanum 436
  „ indica 435
  „ maritima 438
  „ Sieversiana 436
  „ sternutatoria 437
  „ vulgaris 435
Arthrocnemum 653
  „ indicum 655
Artichoke 460
  „ gum 460
Artocarpus integrifolius 749
  „ hirsuta 749

Artocarpus Lakoocha 749
Arum sylvaticum 816
Aruni 708
Arusa 584
Arusak-pas-i-pardah 646
Arushkara 203
Arusiman 55
Arvada 122
Arwah-i-kunjad 550
Arwal 883
Arwi 817
Asa 401
Asafœtida 381
Asan 239, 322
Asana 716
Asarun 420
Asclepiadeæ 509
Asclepias geminata 522
  „ curassavica 524
Asclepiadin 525
Asclepion 525
Asclepione 525
Asfar-i-bari 467
Asfrak 14
Asgand 565, 644
Asham-tagam 378
Ashkhis 673
Ashrash 831
Ashta 744
Askiduliyun 646
Asmarighna 63
Asok, Asoka 257
Asparagin 841
Asparagus adscendens 840
  „ officinalis 841
  „ sarmentosus 840
Asperag 14
Asphodelus fistulosus 831
Asplenium sp. 861
Assalia 56
Asthisanhara 182
Ast-luban 315
Astmabayda 653
Astragalus sp. 288
Asvagandha 644
Asvakarna 92
Asvamaraka 501
Asvattha 743
Ata 24
Ataicha 6
Atalantia monophylla 132
Atarusha 584
Atasi 117
Athanikun 393
Athariyun 218
Athlak 600
Ati-jau 859
Ati-maduram 244
Ati-parich-cham 178
Atis 6
Atisine 7, 8
Ativadayam 6
Ativish 6
Atmagupta 229
Atrakias 657
Attie-vayr 744
Attie-vayr-tannie 744
Aucklandia 452
Avala 700
Avalguja 421
Avalkati 700
Avartani 113
Avirai 264
Ayapana 424
Ayapani 424
Azaddarakht 172
Azaddarakht-i-Hindi 169
Azadirachta indica 168
Azaraki 527
Azbah 78
Azerona 436
Azhinji-maram 399
Azima tetracantha 509
Azmalus 629
Azras-el-kalb 861

Babarang 471
Babbe 87
Babchi 216
Babhul 280, 282
Babooi-toolsi 607
Babreng 471
Babul 280, 282
Babunah or Babunaj 447
Bach 813
Bacha 813
Bachnab 1
Bachnag 1
Badam 292
Badami gond 294
Badam-i-Farangi 198
Badaward 466, 657
Badhal 749
Badian 22
Badian-i-khatai 22
Badinjan-i-barri 636
Badran 393
Badranj 607
Badranjboya 613
Bafaras 876
Baga-dhup 145
Bag-bherenda 694
Baghrendeh 695
Bahel-schulli 586
Bahera 320
Bahman abiad 456
Bahman-i-saffed 456
,, surkh 457
Bahobab 107
Bahubara 570
Bahuvara 570
Bakam 251
Bakas 584
Bakayan 171
Bakila 291
Bakila-i-misri 292
,, i-nabti 38
Baklat-el-awjaa 878
,, humaka 76
Baklat-el-malik 53
,, mubarika 76
,, utrujiya 613
Bakul 480
Bal 393
Bala 99, 109
Balanites Roxburghii 146
Balanophora sp. 877
Balasan 164
Bal-belphal 140
Balbij 100
Balchar 417
Baliospermum montanum 688
Bal-kurai 393
,, kurru or kadu 577
Balm of Mecca 166
Bal-nimb 168
Balong 143
Balsam of Mecca 165
Balsamodendron or Balsamodendrum 154
,, Mukul 159
,, Opobalsamum 164
,, Playfairii 161
,, pubescens 162
,, Roxburghii 159
Balusitun 310
Balvach 813
Balvekhand 813
Bama 579
Bamanhati 598
Bamboo 856
Bambusa arundinacea 856
Bamiya 103
Bana 732
Banada 764
Banafshah 65
Banana 778
Bancudoo-lakki 402
Bandakpusph 756
Bandari 191
Bandaru 404
Banduk-i-Hindi 189

Bang 629
Bangi-ilai 732
Bangust 649
Banj 629
Ban-jai 598
Banhaldi 769
Bankahu 462
Ban-shingara 881
Bans-kapur 856
Bans-lochan 856
Ban-tepariya 643
Banyan tree 745
Baphulli 379
Bar 745
Baragach 682
Bara-gokhru 553
Barbaloins 829
Barberry 35
Bargund 570
Barhal 749
Barhang 650
Bariara 99
Bari-ilachi 788
Bari-kasondi 262
Barilla 654
Bari-main 76
Bari-mishri 881
Bari-pan-ki-jar 777
Bari-saunf 372
Bari-shopha 372
Barik Bhauri 562
Barikmoth 844
Barkak-i-Shirazi 876
Barleria Prionitis 590
Barmi 758
Barringtonia acutangula 326
Barsawashan 862
Barsunga 130
Bartang 650
Bartundi 401
Barun 62
Barzad 390
Basbasah 661
Basfaij 860
Bashing 863
Basil-camphor 607
Basilikon 369
Basingh 532, 863
Basl-el-ansal 830
Basl-el-far 830
Bassia latifolia 476
  „ longifolia 478
Bastra 605
Basura 876
Batareh 154
Batatas paniculata 564, 645
Batavi-nebu 135
Bathooa 879
Batyalaka 99
Bauhinia racemosa 274
  „ tomentosa 274
  „ variegata 273
Bawachi 216
Bayee 162
Bayrbunja 355
Bazaward 657
Bazr-el-ahris 464
  „ anjareh 593
  „ banj-abiad 631
  „ banj-chemar 61
  „ hawah 55
  „ katif 879
  „ katuna 649
  „ khas 460
  „ khumkhum 55
  „ ratab 879
Bdellium 158
  „ Indian 159
  „ opaque 155, 159
Bedanjir 704
Bed-i-bari 732
Bed-i-sadah 732
Bedmushk 731
Bedoli-sutta 401
Behada 320
Behar opium 46

Behen 456
Bel 139
Beli 132
Belgaum walnut 712
Belleric myrobalans 320
Bena 851
Benderwel 186
Bendj 629
Bendri 186
Bengal cardamoms 788
Benincasa cerifera 347
Benzoic acid 488
Benzoilaconine 4
Benzoin 485
  „ Siam 486
  „ Sumatra 487
Berberideæ 35
Berberine 37
Berberis aristata 35
  „ asiatica 35
  „ Lycium 35
Ber-chuni 181
Berengmish 614
Berthelotia lanceolata 449
Betel leaf 727
Betelnut 802
Betula Bhojpattra 730
Bhairah 320
Bhallataka 203
Bhambhurda or Bhambhrur 427
Bhandira 597
Bhang 732
Bhangjala 355
Bhangra 430
Bhant 597
Bhantaki 637
Bharangi 598
Bharbhand 50
Bhargi 598
Bhar-jambul 304
Bharotha 651
Bhasamkand 817
Bhatkatya 636
Bhaulan 404
Bhauphalli 116
Bhava 258
Bhela 203
Bhenda or Bhendi 103
Bhendi tree 105
Bherenda 704
Bhilawa 203
Bhimseni kapur 93
Bhoj 737
Bhojraj 881
Bhokar 570
Bhui amala or avala 701
  „ champa 785
  „ dori 521
  „ kohala 564
  „ kumra 564
  „ okra 599
  „ sarpati 121
  „ singh 246
  „ turwar 263
Bhujpatr 730
Bhumiku-shmanda 564
Bhumyamlaki 701
Bhunimba 537
Bhuri-lak 180
Bhuringni 636
Bhurjapatra 730
Bhurundi 574
Bhustrina 852
Bhuta 855
Bhutapala 179
Bhut-birarvi 604
Bhuyaterada 594
Bibba 203
Bibla 239
Bidari-kand 234
Bignonia suaveolens 546
  „ xylocarpa 544
Bignoniaceæ 544
Bihi-danah 302
Bijanwari 882
Bijband 661

Bijtarka 566
Bijisar 239
Bikh 1
Bikhma 9
  „ alkaloid of 10
Bikh-i-banafshah 793
Biki-i-wala 851, 852
Bilai-kand 234, 564
Billu 177
Bimbal 844
Binghar-bij 831
Binnuge 522
Birang-i-Kabuli 471
Biranj-i-Kabuli 471
Biranjasif 429
Birch bark 730
Birdlime 755
Bireja 390
Biriz 390
Birhatta 637
Birja 757
Birmi or Barmi 758
Bish 1
Bishalanguli 832
Bishma 9
  „ alkaloid of 10
Bish mush bisha 11
Bishop's weed 365
Bitter almonds 292
Bixa orellana 73
Bixin 73
Bixineæ 67
Black abir 780
  „ cummin 15
  „ dammer 167
  „ pepper 718
  „ zedoary 773
Blairia nodiflora 599
Blepharis edulis 593
Blumea aurita 428
  „ balsamifera 95
  „ sp. 427
Bodha 187
Boerhavia diffusa 655
Boi 394
Bois de couleuvre 534
Bokenal 468
Bokhara plum 294
Bokhat 831
Bokhera 745
Bol 154
Bolkad 778
Bolsari 480
Bombax malabaricum 106
Bombay mace 664
  „ mastich 195
  „ sumbul 394
Bone-setter's lep 291
Bonduc-nuts 250
Bon-nil-gachh 217
Boo, *see* Bu.
Borage 571
Boragineæ 570
Boranti 882
Borassus flabelliformis 801
Bori ajmud 370
Borneene 95
Borneo camphor 93
Borneol 94
  „ artificial 95
Boswellia 148
  „ Frereana 150
  „ glabra 152
  „ serrata 152
Bovista, sp. 878
Bowstring Hemp 842
Bozidan 876
Bragantia Wallichii 681
Brahmadandi 50, 423, 467
Brahmamanduki 361
Brahmayashtika 598
Brahmi 361, 579
Brassica campestris 58
  „ juncea 58
  „ nigra 58
Brazilin 252

Briedelia montana 716
Brindao 78
Brucine 530
Bryonia epigæa 353
  „ laciniosa 354
  „ rostrata 355
  „ sp. 720
  „ umbellata 346
Bryonin 354
Bryonitin 354
Bryophyllum calycinum 359
Buckshorn plantain 878
Bugloss 571
Bu-i-madaran 429
Bujr-bunga 355
Buka-bish-mush 11
Bu-kalia 574
Bukchi 216, 421
Bukka 780
Buko 253
Buli 112
Bur 843
Buratu 843
Burda-gumudu 347
Burseraceæ 148
Burundi 574
Butea frondosa 231
  „ parviflora 232
  „ superba 234
Buzghanj 194
Byakura 637
Bysabol 158

Cacalia Kleinia 463
Cæsalpinia Bonducella 248
  „ digyna 251
  „ pulcherrima 255
  „ Sappan 251
Cajuput oil 331
Cajuputine 332
Calabash 548
Calamus aromaticus 537, 813
  „ Draco 806
Californine 490
Callicarpa lanata 605
Calonyction speciosum 561
Calophyllum inophyllum 86
  „ tomentosum 87
  „ Wightianum 87
Calosanthes indica 547
Calotropis gigantea 512
  „ procera 512
Calumba root 25
  „ wood 34
Camphol 95
Camphor 665
Camphor Borneo 93
  „ China 665
  „ Japan 665
  „ oil 95
Camphyl alcohol 94
Canarese pepper 721
Canarium strictum 167
Cannabene 739
Cannabin 741
Cannabis sativa 732
Canscora 542
  „ decussata 542
Canthium parviflorum 409
Canton stick rhubarb 660
Capparideæ 61
Capparis aphylla 64
  „ spinosa 64
  „ zeylanica 65
Caper root 64
Capric acid 65
Capsaicin 642
Capsicin 640
Capsicol 642
Capsicum annuum 640
  „ fastigiatum 640
  „ grossum 640
  „ nipalense 640
Caraway 367
Cardamomum majus 883
  „ siberiense 22

Cardamoms 786, 883
Cardiospermum Halicacabum 187
Cardol 200
Carduus nutans 466
Careya arborea 327
Carica papaya 356
Carissa Corandas 507
Caroxylon 653
Carpobalsamum 164
Carrageen moss 874
Carrot 380
Carthamin 465
Carthamus tinctorius 464
Carum carui 367
  ,, copticum 365
  ,, nigrum 368
  ,, Roxburghianum 378
Caryophyllus aromaticus 328
Casha-maram 325
Cashew-nut 198
Cassia 667
Cassia Absus 267
  ,, alata 266
  ,, angustifolia 268
  ,, auriculata 264
  ,, buds 670
  ,, fistula 258
  ,, obovata 263
  ,, occidentalis 262
  ,, Senna 263
  ,, Sophera 260
  ,, Tora 265
Cassumunar 770
Cassytha filiformis 672
Castine 602
Castor oil 706
  ,, seeds 704
Casuarina equisetifolia 750
Catechin 284
Catechu 283
Catelæ-vegon 678
Cayenne pepper 640
Cay-nge-ba 402
Cay-boi-boi 575
Cay-nhan 402
Cay-o-ro 591
Cedrela Toona 177
Cedrus Deodara 757
Celastrineæ 178
Celastrus paniculata 178
Celery 370
Celosia argentea 655
Celsia coromandeliana 580
Celtis dysodoxylon 748
Centaurea Behen 456
Centipeda orbicularis 437
Cephalandra indica 351
Ceratogynum rhamnoides 582
Cerbera Odollam 508
  ,, Thevetia 503
Ceropegia bulbosa 526
Ceylon moss 872
Chaina 842
Chakonda 265
Chakra-bhenda 100
Chakramarda 265
Chaksu 267
Chakulia 221
Chakut 267
Chale-michhri 789
Chalmari 715
Chamar-musli 186
Chambeli 474
Chammaha 420
Chamomile 447
Champa 23
Champai 254
Chana 256
Chana-amba 256
Chanakamla 256
Chanda-kuda 747
Chandala 747
Chandan 751
Chandi-bhasma 829
Chandra 505
Chandrasura 57

Chandwar 689
Chane ka sirkah 256
Changeri 121
Changeri ghrita 121
Chanoti 223
Charas 732
Charati 67
Charchah 657
Charelah 864
Chasmizak 267
Chashum 267
Chaulmogra 67
Chavak 721
Chawal-mungri 67
Chay-root 404
Chebulic myrobalans 317
Chebulinic acid 320
Cheluppaimaram 179
Cheena ghanza 818
Chenopodiaceæ 653
Chenopodium album 879
Chenyel 843
Chervil 878
Cheshmak 267
Chhagal-kuri 563
Chhatian 491
Chhatin 491
Chik 41
Chikana 99, 672
Chikku 482
Chillies 640
Chimr or Chimid 267
China braziliensis 490
  „ californica 490
  „ nova 490
  „ paraguatan 490
  „ root 838
Chini badum 246
  „ bol 155
  „ ghas 368, 872
  „ katha 413
  „ salit 656
Chinia gond 239
Chinol 267
Chintz 270
Chir 756
Chiratin 539
Chiratogenin 539
Chirayata 536
Chirboti 643
Chirchira 651
Chireta 536
Chirphal 127
Chirval 404
Chita 620
Chitra 620
Chitrak 620
Chitraka 620
Chitratandoola 471
Chittira 620
Chloroxylon Swietenia 177
Chobchini 838
Chog 455
Chondrus crispus 874
Chorie ajooan 61
Chota-chand 505
Chota-gokhru 119
Chota-kirayta 541
  „ kulijan 774
Chote-pan-ki-jar 774
Choti main 78
Chrysanthemum coronarium 448
  „ Roxburghii 448
Chrysophanic acid 261
Chubchini or Chobchini 838
Chuch 624
Chugala 293
Chuka 658
Chuka-tripati 121
Chukra 658
Churi chintz 107
Cicer arietinum 256
Cichorium Intybus 461
Cinnamomum Camphora 665
  „ Cassia 667, 670
  „ iners 668, 670

Cinnamomum Tamala 670, 760
Cinnamon 667
Cissampelos Pareira 29
Citric acid 138
Citronella grass 853
Citrons 134
Citrullus colocynthis 336
„ vulgaris 350
Citrus acida 134
„ Aurantium 134
„ decumana 135
„ Limonum 139
„ medica 134, 139
Clearing nut 532
Clematis triloba 21
Cleome viscosa 61
Clerodendron inerme 598
„ infortunatum 597
„ phlomoides 599
„ Siphonanthus 598
„ serratum 598
Clitorea ternatea 235
Cloves 328
Clove stalks 320
Cneorum tricoccon 673
Cocci orientis 27
Coccinia indica 351
Coccole di Levante 27
Cocculus indicus 27
„ Leæba 33
„ villosus 32
Cochin Turmeric 770
Cochlospermum Gossypium 73
Cocinine 801
Cocoanut 800
„ oil 800
Coco de mer 804
Cocos nucifera 800
Codaga pala 498
Codagam 361
Coix lacryma 853
Colchicum sp. 835
„ variegatum 837
Coldenia procumbens 576
Coletta-veetla 590
Coleus aromaticus 608
Colloturine 490
Colocasia antiquorum 817
Colocynth 336
Colocynthin 338
Colocynthitin 338
Columbic acid 26
Columbin 26
Combretaceæ 317
Commelinaceæ 842
Compositæ 421
Conessi barn 498
Conessine 499
Conhydrine 364
Conia 364
Coniferæ 756
Conium maculatum 363
Connaraceæ 208
Conocarpus latifolia 324
Convolvulaceæ 556
Convolvulin 469
Conylene 364
Copal gum 291
Coptine 19
Coptis Teeta 18
„ trifoliata 19
Coorundootievayr 717
Corallocarpus epigœa 353
Corchorus fascicularis 115
„ olitorius 115
„ trilocularis 115
Cordia myxa 570
„ obliqua 570
Coriander 375
Coriandrum sativum 375
Cornaceæ 399
Cornsilk 855
Cornutia corymbosa 604
Corte de pala 498
Coscinium fenestratum 34
Costus 449

Costus speciosus 779
Cotton 109
Coumarin 212
Cowhage 229
Crassulaceæ 359
Cratæva religiosa 62
Crescentia Cujete 548
Crescentic acid 548
Cressa cretica 569
Cress seeds 56
Crinum asiaticum 820
„ latifolium 822
„ ornatum 822
Crocetin 797
Crocin 797
Crocus sativus 796
Croton hypoleucos 684
„ oblongifolium 682
„ oil 684
„ polyandrum 688
„ Tiglium 684
Crotonoleic acid 687
Crozophora plicata 716
Cruciferæ 54
Cubeb camphor 726
Cubebic acid 727
Cubebin 726
Cubebs 725
Cucumis pseudocolocynthis 338
„ trigonus 338
Cucurbitaceæ 336
Cumac 724
Cuminum cyminum 369
Cuminol 369
Cummin 369
„ black 15, 369
Cundunghatrievayr 636
Cupameni 714
Cupuliferæ 729
Curculigo orchioides 818
Curcuma angustifolia 768
„ aromatica 769
„ cæsia 773
Curcuma domestica minor 773
„ long 773
„ longa 764
„ Zedoaria 769, 771
„ Zerumbet 771
Curcumin 767
Cuscuta reflexa 569
„ species 568, 569
Custard apple 24
Cutch 284
Cymol 369
Cynan 442
Cynanchum extensum 523
Cynara scolymus 460
Cynarin 460
Cynene or Cinene 440
Cyneol 441
Cynodon dactylon 854
Cyperaceæ 844
Cyperus pertenuis 845
„ rotundus 844

Dabi-duba 818
Dabra 221
Dabria 324
Dad 854
Dadima 309
Dadmardan 266
Dadmari 304
Dadrughna 266
Dadumari 818
Dædalacanthus roseus 587
Dagada-phul 864
Dagra 6
Dahu 749
Dajjaj 162
Dakh 184
Dakhnirbishi 29
Dalbergia sympathetica 236
„ volubilis 237
Dalchini 667
Dalik 298
Dalim 309

Daman-papar 403
Dammar, black 167
,, white 93
Dam-el-akhwain 806
Dam-eth-thuaban 807
Dam-et-tinnin 807
Dand 534, 685
Dand-el-sini 534
Dandotpala 542
Dankuni 542
Danti 688
,, harataki 688
Dantimul 688
Darakht-i-gul-chakan 476
Darakht-i-miswak 624
Darbh 854
Darchini 667
Daree 234
Darfilfil 722
Darhalad 35
Darim 309
Darina 55
Darnel-grass 860
Dar-shishaan 750
Daru or Darv 315, 485
Daruharidra 35
Darunaj-i-akrabi 442
Daruri 50
Darya-ka-nariyal 804
Dasamula kvatha 119
Dasmuli 587
Datir 746
Datisca cannabina 355
Datisceæ 355
Datiscine 356
Datte-phal 326
Datura alba 626
,, fastuosa 626
,, species 628
,, Stramonium 629
Daturine 628
Datwan 703
Daucus Carota 380
Dawalah 864
Daye 222
Decaneurum microcephalum 423
Deek 199
Deishar 101
Delphinium altissimum 14
,, denudatum 11
,, saniculæfolium 14
Deodagri 343
Deodar 757
Deokapas 110
Deonal 468
Deonal-gawat 883
Desert date 147
Desmodium gangeticum 222
Devadaru 757, 892
Dhai 306
Dhaiphul 306
Dhaiali 882
Dhaiti 306
Dhak 231
Dhakti-dudhi 694
Dhalakura 399
Dhamani or Dhaman 116
Dhamasa 120
Dhana 375
Dhanya 375
Dhaoshi 306
Dhaoya 324
Dharmana 116
Dharu 618
Dhastura 626
Dhatri 700
Dhatri lauha 700
Dhatura 626
Dhaturia's 627
Dhaura 324
Dhava 324
Dhaval 468
Dhera 399
Dheras 103
Dhol 581
Dholasa mudrika 187

Dhuna 92
Dhup 149
Dhustura 626
Dibk 570, 754
Dicoma tomentosa 468
Difli 501
Dihn 694
Dijaj 163
Dijj 162
Dikamali 410
Dilivaria ilicifolia 590
Dill 374
Dinda 187
Dioscorea aculeata 842
  „ bulbifera 843
  „ globosa 842
  „ pentaphylla 843
  „ sativa 842
  „ tomentosa 843
  „ triphylla 843
Dioscorineæ 842
Diospyros Embryopteris 483
  „ melonoxylon 485
Dipmal 611
Dipterocarpeæ 88
Dipterocarpus alatus 88
  „ incanus 88
  „ turbinatus 88
Diraksha pazham 184
Dita 492
Ditain 492
Ditamine 494
Dodonæa viscosa 191
Dœmia extensa 523
Dola kura 497
Doli oil 478
Dolichandrone falcata 546
Dolochapo 508
Dolo Shamlo 106
Domba oil 87
Doo, *see* Du
Dopatilata 563
Dorgunj 879
Dorema Ammoniacum 392
  „ Aucheri 392
  „ aureum 396
Dorli 637
Doronicum pardalianches 442
Dovi-usht 589
Dowalah 864
Dowla 221
Downa 436
Dracœna Cinnabari 810
  „ Schizantha 811
Draconyl 807
Dracyl 807
Dragon's blood 806
Drakh 184
Draksha 184
Draksha-arisha 184
Dregea volubilis 524
Droga amara 583
Dronapushpi 617
Dryobalanops aromatica 93
Duda-sali 510
Dudhali 398, 581
Dudhi 693
Dudhi wood 499
Dudhiya hemkand 876
  „ mishri 882
Dudurli 525
Duhn-el-fagiya 307
  „ garjan 88
  „ hal 550
  „ kandul 750
  „ -i-ward-i-kham 298
  „ „ matbukh 298
Dukak kundur 149
Dukh 162
Dukhan ed daru 315
Duku 379
Dukus 380
Dumur 745
Durah-i-Makka 855
  „ kizan 855
  „ Shami 855

Duralabha 218
Duras-i-Tafti 363
Durba 854
Dur-i-haskhak 486
Dustparisha 718

Ebenaceæ 483
Ebony 485
Ecballium Elaterium 352
Ecbolium Linneanum 592
Echites scholaris 492
Echicaoutchin 495
Echicerin 495
Echiretin 495
Echitamine 495
Echitein 495
Echitenine 495
Echitin 495
Echium sp. 571
Eclipta alba 430
,, prostrata 430
Ecorce de lautour 490
Edah 811
Eejin or Eeyin 853
Egyptian myrobolan 147
,, opium 46
Ehretia buxifolia 576
,, obtusifolia 576
El-Omarah 107
Ela 786
Elæodendron glaucum 179
Elaka 786
Elakay 786
Elaterin 352
Elaterium 352
Elchi 76
Elecampane 444, 450
Elephant creeper 566
Elephantopus scaber 423
Elettaria Cardamomum 786
El-heglyg 147
Elia 823
Ellu 549
Elumich-cham-pazham 134
Elwa 823
Embelia ribes 471
Emblic myrobalans 700
Emex, species 657
Endive 461
Endrani 661
Enghinar 460
English opium 47
,, rhubarb 660
Enicostema littorale 541
Entada Pursætha 276
,, scandens 276
Eraka 843
Eranda 704
Eranthemum roseum 587
Erendi 704
Ericaceæ 469
Erigeron asteroides 429
Eriodendron anfractuosum 106
Erukkam 512
Erukku 512
Ervados 377
Erythræa Roxburghii 541
Erythrina indica 230
Erythroxylon monogynum 892
Esesh 148
Eshopghol 648
Ettikkottai 526
Eugenia Jambolana 333
Eugenol 330
Eulophia 789
,, campestris 789
,, herbacea 789
Eupatoria 543
Eupatorium Ayapana 424
,, cannabinum 543
Euphorbia Cattimandoo 693
,, hirta 693
,, parviflora 694
,, neriifolia 689
,, thymifolia 693
,, Tirucalli 694

Euphorbiaceæ 682
Euphorbic acid 692
Euphorbium 691
Euphorbon 692
Euryale ferox 38
Evodia Roxburghiana 128
Evolvulus alsinoides 564
,, hirsutus 564
Exacum bicolor 440
Excæcaria Agallochum 674, 676
Ezhilaip-palai 491

Faba bengalensis 319
,, marina 277
Faghureh 127
Fagonia arabica 120
Fahlui 614
Fakuliyun 307
Fakumilas 295
Famine foods 886
Farakiyun 218
Faranjmishk 614
Farasiyun 619
Farasiyun-i-piyazi 620
Farfiyun 691
Farid-buti 32, 554
Fashara 878
Fashashish 486
Fatarfoda 716
Fawania 17
Fazukus 315
Female Peony 17
Fennel 372
,, root 372
Fenugreek 209
Feronia elephantum 142
,, gum 143
Ferula alliacea 381
,, galbaniflua 390
,, Narthex 385
,, rubricaulis 390
,, species 396
,, Tingitana 393
Ficoideæ 74
Ficus asperrima 746
,, bengalensis 745
,, Carica 745
,, cordifolia 744
,, glomerata 744
,, hispida 745
,, religiosa 743
,, retusa 745
Figs 745
Filfil 719
,, ahmar 640
,, muiyeh 722
,, i-surkh 640
Filices 860
Finduk-i-Hindi 189
Fiturasaliyun 371, 378
Flacourtia cataphracta 74
Flemingia Grahamiana 710
Fluggea virosa 717
Fœniculum vulgare 372
Fœnum camelorum 850
Folia Malabathri 670
Folium hirci 604
Frankincense 149
Fructus carpesiorum 725
Fufal 802
Fujl 724
Fulla pipa 832
Fumaria officinalis 52
,, parviflora 52
Fumariaceæ 52
Fumaric acid 53
Fumarine 53
Fumitory 52
Fungi 865
Fuvvah 415
Fuzukas 486

Gab 483
Gachkaran 588
Gadambi-kanda 822
Gadida-gada-para-aku 679

Gaer-honar-pata 820
Gafiz 14
Gahula 295
Gajga 248
Gajir-bij 380
Gaj pipal 877
Galamark 694
Galangal 775
„ great 777
Galangin 776
Galangol 776
Galbanum 390
Galega purpurea 218
Galhar-ka-patta 874
Gallic acid 730
Galls 729
Gambhari 599
Gambier 413
Gamboge 83
Ganasur 682
Gandagatra 24
Gandah-biroza 152, 756
Gandati 679
Gandhabháduli 400
Gandhali 400
Gandha-umbar 745
Gandha-bena 852
Gandhanakuli 792
Gandoo 277
Gandum-i-Makka 855
Ganikarika 604
Ganja 732
Ganja-ilai 732
„ phal 732
„ rasham 732
Ganjera 733
Gaoshir 390
Gaozaban 571
Garambi 276
Garbhaghatini 833
Garcinia indica 78
„ mangostana 82
„ morella 83
Garcinia zanthochymus 81
Gardenia florida 410
„ gummifera 410
„ lucida 410
Gardenic acid 413
Gardenin 411
Gardul 276
Gargu-naru 354
Garjan Balsam 88
Garjan ka tel 88
Garjara 380
Garlic 841
Garuga pinnata 167
Gashagasha 39
Gavala 295
Gazangabin 76
Gazanjabin 76
Gazbar 76, 78
Gazmazu 76
Gech-chakkay 248
Gedwar 13
Gee, *see* Gi.
Gelaphal 406
Gelidium cartilagineum 868
„ corneum 868
Gelose 868
Gentian 543
Gentiana Chirayita 537
„ Kuroo 578
Gentianaceæ 536
Geraniaceæ 121
Ghaimari 359
Ghannasaphan 842
Ghannaskanda 812
Ghanta-chi-baji 408
Gharbhuli 628
Gharikun 865
Gharol 30
Ghasool 654
Ghati 638
Ghati gum 144
Ghati-mirchi 640
Ghati-pitpapra 591

Ghezo 77
Ghisi 780
Ghorwel 186
Ghosha-lata 342
Ghritakumari 823
Ghungchi 223
Ghureh 184
Ghusul 851
Giah-i-Kaisar 211
Gila-gach 276
Giloe 30
Giloe ka sat 31
Gingeli or Gingelly oil 551
Ginger 762
Gingerol 763
Gino 186
Girikarmika 218
Gith 15
Gloiopeltis tenax 868
Gloriosa superba 832
Glossocardia Bosvallea 433
,, linearifolia 433
Glycyrretin 246
Glycyrrhiza glabra 244
Glycyrrhizin 245
Gmelina arborea 599
Goagari-lakri 528, 533
Goa-pepper 640
Gobhi 423
Gojialata 423
Gojihba 423
Gokaran 235
Gokhru bara 553
,, chota 119
,, kalan 459
,, lahana 119
Gokshuri 119
Golan 882
Golmirch 718
Goma 617
Gometta 346
Gondala 811
Gonsurong 682
Goo, *see* Gu.
Goomodee 234
Gopichandan 49
Gora nimb 130
Gora-tel 246
Gora-vach 813
Gor-giyah 851
Gori undi 85
Gorakh amli 107
,, chintz 107
,, mundi 426
Goshtam 449
Gossypium herbaceum 109
Gota ganba 83
Govindphal 65
Gowai-mirchi 640
Gracilaria lichenoides 872
Gramina 854
Gramineæ 847
Grangea madraspatana 434
Grapes 184
Gratiola Monniera 579
Great galangal 777
Grewia pilosa 116
,, tiliæfolia 116
Grislea tomentosa 306
Groundnut 246
,, ,, oil 247
Gua-babhul 281
Gualtheria fragrantissima 469
Guatteria longifolia 258
Guava 334
Guaza 732
Guchchapushpi 306
Gugal 152
Guggula 153
Guizotia abyssynica 432
,, oleifera 432
Gujar 288
Gu-kikar 281
Gul-i-anwel 254
,, banafshah 66
,, gafith 542

Gul-i-gaozaban 571
  „ hamaz 659
  „ jalil 14
  „ kamah 473
  „ khairu 96
  „ pistah 194
  „ sakari 99
  „ sang 865
  „ tun 177
  „ turah 255
  „ urba 615
Gulab 298
Gul Abbas 657
Gulab ka attar 299
  „ phul 298
Gulal 251
Gulancha 30
Gulangabin 299
Gulappu 298
Gulap-phul 298
Gulchandni 561
Gulcheri 832
Gul Daoudi 448
Guler 744
Guli 213
Gul-Jafari 466
Gul-Kamah 473
Gulkand 298
Gulnar 309
Guloe 30
Gulshabbo 832
Gulwail 30
Gum Arabic 277
  „ Bassora 294
  „ Benjamin 485
  „ Copal 291
  „ Feronia 143
Gundbel 851
Gundis 851
Gundu-mani 223
Gunj 223
Gunja-gawat 882
Guntul 851
Gunza 223
Gurach 30
Guraku 633
Guranda 748
Gurbah-i-dashti 851
Gurbiani 20
Guren 304
Gurgindi 883
Gurjunic acid 91
Gurmala 258.
Gurmali 881.
Guti 181, 839
Gutta Gambier 414
Guttiferæ 78
Gutwel 839
Guvaka 802
Gymnema sylvestre 521
Gynandropsis pentaphylla 62
Gynocardia odorata 67
Gynocardic acid 70

Habak Hadi 158
Hab-el-ass 335
  „ arhar 762
  „ asfar 464
  „ balasan 164, 166
  „ fakad 602
  „ ghar 672
  „ kakanaj 646
  „ kalb 203
  „ khatai 685
  „ kilkil 878
  „ kulai 229
  „ nil 558
  „ mishk 102
  „ muluk 691
  „ rashad 57
  „ salatin 685
  „ souda 15
  „ soudan 267
Habhab or Habhabu 107
Hadak 636
Hadavarna 62

Hadha naeptanam 394
Haft-barg 673
Hagenia abyssinica 296
Haj 218
Halad 764
Haldi 764
Halileh-i-asfar 318
  „ Chini 318
  „ Hindi 318
  „ Jawi 318
  „ Kabuli 318
  „ Zangi 318
  „ zireh 318
Halilutan 878
Halim 56
Haliyun 841
Hamama 877
Hamamelideæ 313
Hamaz 659
Hansraj 861
Hanzal 336
  „ ahmar 345
Har 317
Harandori 524
Harbara 250
Hardi 177
Hardwickia binata 287
Haridradve 765
Harikassa 590
Haritaki 317
Harjora 182
Harjuya 574
Harkai 505
Harkuch-kanta 590
Harmaline 126
Harmine 126
Harsankar 182
Harshaf 460
Harsinghar 473
Hartikah 593
Hasak 119
Hasba 619
Hashish 740, 875
Hashishat-el-baraghit 380
  „ kalb 619
Hasiluban-el-Javi 485
Hastipata 423
Hastula regia 831
Hati-shura 574
Hazar-danah 693
  „ fishan or Hazar-kashan 878
Hazaz-el-sakhar 865
Hedychium spicatum 780
Hee, *see* Hi.
Hejurchei 611
Hela 320
Helicteres Isora 113
Heliotropium brevifolium 576
  „ europæum 575
  „ indicum 574
  „ undulatum 576
Hemidesmus indicus 509
Hemlock 363
Hemp Agrimony 543
Hemprichia erythræa 162
Hemsagar 360
Henbane 629
Henna 307
Hennotannic acid 308
Herba doce 377
  „ mæroris alba 702
  „ „ rubra 702
  „ solaris 575
  „ Schœnanthi 850
  „ spiralis hirsuta 779
Hermodactylus 835
Herpestis Monniera 579
Hesperetic acid 138
Hesperidin 137
Hesperitin 138
Heterophragma chelonioides 545
  „ Roxburghii 544
  „ suaveolens 456
Hewar 281
Hibiscus Abelmoschus 102
  „ cannabinus 104

Hibiscus esculentus 103
,, rosa sinensis 98
,, Subdariffa 104
Hijjal 326
Hijjala 327
Hijli badam 198
Hikal 262
Hil 786
Hil-bawa 787, 883
Hiltit 381
Hindyba 461
Hing 381
Hingan 146
Hinganbet 146
Hingra 382, 385
Hingu 381
Hinna 307
Hinna-i-koreish 864
Hippion orientale 541
Hira dakhan 806
,, dukhi 806
Hirankhori 116
Hiranwel 400
Hirda 317
Hoa-phung 255
Hœmodoracæ 842
Hog gum 294
Hog plum 205
Holarrhena antidysenterica 497
Holly-leaved Acanthus 591
Holostemma Rheedii 525
Hoo, *see* Hu.
Hopea recemosa 489
Horehound 619
Hotai 162
Hoya viridiflora 524
Hrasva-pancha-mula 119
Hrivera 109
Hulbah 209
Hulhul 61, 62
Huni 239
Hurf 56
Hurhur 61, 62
Hurina-shook-China 838
Hurmal 124
Hurmaro 124
Hushi 390
Husn-i-yusuf 875
Husrum 184
Huziz-i-Hindi 35
Hydnocarpus Wightiana 71
Hydride of Cannabene 739
Hydrocotyle asiatica 361
Hygrophila spinosa 585
Hymenodictyon excelsum 404
Hymenodictyonine 406
Hyoscinic acid 632
Hyoscyamine 631
Hyoscyamus albus 629
,, niger 629
,, reticulatus 631
Hyoscyne 632
Hypecoum procumbens 54
Hypoxis orchioides 818
Hystrix frutex 590

Ichchura-muli 678
Ichnocarpus frutescens 509
Igasurine 530
Iklil-el-malik 211
Ikshugandha 119, 586
Ilachi 786
Ilachi danah 788
Ilaik-kalli 689
Ilak-i-Rumi 195
Ilak-el-ambat 194
Ilavangappu 328
Ilayechi 786
Illicium anisatum 22
,, Griffithii 22
,, religiosum 22
Ilupai-punak 478
Imbural 404
Imli 270
Indai 832
Indarjau bitter 497

Indarjau sweet 500
Indian bdellium 159
 ,, hemp 732
 ,, lycium 35
 ,, madder 404
 ,, mastich 194
 ,, turnsole 574
 ,, walnut 712
 ,, winter green 469
Indican 215
Indiglucin 215
Indigo 213
 ,, blue 215
Indigofera anil 213
 ,, aspalathoides 215
 ,, enneaphylla 215
 ,, pauciflora 213
 ,, tinctoria 213
 ,, trifoliata 216
Indivara 38
Indravaruni 336
Indrayan 336
Indrayava 497
Inji 762
Inulin 443
Ionidium suffruticosum 66
Ipomœa biloba 563
 ,, bona-nox 561
 ,, cœrulea 558
 ,, digitata 563
 ,, hederacea 558
 ,, muricata 562
 ,, pescapræ 563
 ,, Quamoclit 561
 ,, reniformis 566
 ,, Turpethum 556
 ,, vitifolia 566
Irideæ 793
Iris fœtidissima 794
 ,, germanica 793
 ,, pseudo-acorus 794
 ,, species 795
Irojappu 298
Irsa 793
Isapghol 648
Ishan-chedi 801
Ishappukol-virai 648
Isharmul 678
Iskabinah 396
Iskiras 629
Ispaghol 648
Ispand 124
Isparzah 649
Iswan 307
Itrilal 878
Ixora Banduca 410
 ,, coccinea 410
Izkhir 850
Izkhir-i-jami 851, 852

Jack tree 749
Jadeh 615
Jadikkay 661
Jadipattiri 661
Jadwar 11, 769
Jaephal 661
Jafarabad Aloes 823
Jagatmadan 592
Jaggam 74
Jagnodumar 744
Jahari-naral 804
 ,, sontaka 507
Jaimangal 547
Jaiphal 661
Jal 624
Jal-kunbhi 811
Jamalgota 684
Jambava 333
Jambira 134
Jambul 333
Jambu 333
Jamti-ki-bel 32
Jamun 333
Jambura 333
Janar 855
Jangli-akrot 712

Jangli arandi 694
- „ badam 321
- „ chichonda 343
- „ erendi 697
- „ haldi 769
- „ jaephal 663
- „ kali-mirchi 129
- „ kanda 834
- „ kulthi 217
- „ methi 99
- „ mudrika 48
- „ parul 343
- „ pikwan 519
- „ piyaz 829
- „ suran 815
- „ takla 260
- „ til 551
- „ ushbah 839

Jangomas 74
Japaconitine 4
Japanese Isinglass 868
Japatri 661
Japhal 712
Japhar 73
Jarak nebu 134
Jaramla 701
Jasminum arborescens 475
- „ grandiflorum 474
- „ Sambac 475

Jassund 98
Jassundi 257
Jatamansi 417
Jatamasi 417
Jateorrhiza Calumba 25
Jati 474, 661
Jatiphala 661
Jatropha Curcas 694
- „ glandulifera 697
- „ multifida 697
- „ nana 699
- „ oil 695

Jatrophic acid 697
Jau-i-barahneh 859
Jawantri 661
Jawasa 218
Jawashir 390
Jawitri 661
Jawitri-ka-tel 662
Jayanti 254
Jayapala 684
Jaypal 684
Jazar 380
Jet 254
Jesthimadh or Jesthimadh 244
Jhar-ki-haldi 34
Jhau 77
Jingan 202
Jingini 202
Jingili 551
Jintiyana 543
Jira 369
Jiraka 369
Jival 202
Job's tears 853
Jouz-bawwa 661
Jouj-el-kai 407
- „ mathil 627

Jui-pani 588
Jujube 180
Juljulan 550
Julnar 309
Jumiz 744
Juncus odoratus 850
- „ triangularis 844

Jung-gala 401
Juniperus communis 762
Jussiæa suffruticosa 325
Justicia Ecbolium 592
- „ Gendarussa 592
- „ nasuta 588
- „ picta 585
- „ procumbens 591

Juzugri 747
Jyautishmati 187

Kababchini 724

Kababeh 724
Kababeh-i-dahan kushadah 127
Kabar 64, 626
Kabarish 64
Kabath 624
Kachara 847
Kachnar 273
Kachora or Kachura 771
Kachu 817
Kachula 527
Kachuman 646
Kadalai 256
Kadalai-kadi 256
Kadali 777
Kadamba 409
Kadapara 679
Kadat-rengay 804
Kadavanchi 341
Kadim-el-bint 431
Kadu 540
Kadugu 58
Kadu dorka 342
,, kavatha 71
,, sirola 342
Kaduk-kai 317
Kaduma 55
Kæmpferia rotunda 785
Kæmpferide 776
Kæmpherid 776
Kaf Ayesha 54
,, Maryam 54, 600
Kaf-i-Adam 458
Kafnus 53
Kafur 665
Kafur-kachri 780
Kah-i-Makah 851
Kahu 323, 459
Kaikahr 92
Kaikeshi 430
Kaiphal 663, 749
Kaivishi-ilai 430
Kaj 24
Kajali 235
Kajar-wel 533
Kajit 593
Kaju 198
Kajra 526
Kajur 801
Kakalia 878
Kakamachi 638
Kakanah 646
Kakapu 581
Kakhan 624, 626
Kakhanela 626
Kakkanan-kodi 235
Kakkata shingi 191
Kakkay-kolli-virai 27
Kakmachi 638
Kakmari 27
Kaknaj 643, 645
Kaknaj-el-manoum 643
Kakphal 27
Kakrasingi 191
Kakrondah 428
Kakria 231
Kakui oil 713
Kakulah 786
Kakulah-i-kibar 883
Kakulak 860
Kala 777
Kala adulsa 585
,, damar 167
,, danah 558
,, dhatura 626
,, drakh 185
,, jam 333
,, jíra 15
,, karwah 404
,, khajur 173
,, kura 500
,, nagkesar 670
,, poti-akola 880
,, til 432
,, vala 109
Kalaippaik-kizhangu 832
Kalaka 507

Kalakh 393
Kalamba-ver 25
Kalam kachri 25
Kalamb-ki-jer 25
Kalanchoe laciniata 360
„ pinnata 359
Kalangura 486
Kalarva 624
Kalfah 667
Kali haldi 773
„ jiri 421
„ kanghi 101
„ kasondi 260
„ kutki 577
„ meri *or* Kali-mirch 718
„ musli 818
„ pandan 861
„ ziri 421
Kalikari 832
Kalinga 497
Kalingad 350
Kaliun 649
Kalizer 235
Kalkas 818
Kalkasi 818
Kal-kasonda 260
Kalli 694
Kallurivi 304
Kalmeg 582
Kalonji 15
Kalpam 732
Kalsunda 590
Kamafitus 428
Kamagu 802
Kamak 393
Kamal 37
Kamala 708
Kamalin 712
Kamal-kakri 38
Kamarkas 239, 611
Kamazariyus 426
Kamela-mavu 708
Kamila 708
Kamkam 486
Kamla nebu 134
Kamlata 561
Kamohi 703
Kamohi-jo-chodo 703
„ jo-pun 703
Kampilla 708
Kamraj 880
Kamugu 802
Kamun 369
Kamuni 638
Kamun-el-muluki 365
Kanab 734
Kanabira 734
Kanakaphala 684
Kanana-eranda 694
Kanbher 793
Kanchan 273
Kanchanara 273
Kanchari 466
Kanchkuri 717
Kanchuri-vayr 718
Kandahari hing 388
Kandal 393
Kandan-kattiri 636
Kandar 393
Kandawel 182
Kande 829
Kandol 112, 750
Kanduri 351
Kangar 460
Kangar-i-sufed 467
Kangarkhar 657
Kangar-zad 460
Kanghi 100
Kangoni 178
Kanir 500
Kanjiyal 777
Kankuti 267
Kanocha 703
Kanphuti 61
Kankra 400
Kantagur-kamai 509

Kantajati 590
Kantakari 636
Kantakaryavaleha 636
Kantanatia 652
Kantawaras 464
Kantekangi 842
Kantemat 652
Kanturiyun 877
Kanval 37
Kanwel 883
Kanya 823
Kapas 109
Kapikachhu 229
Kapitta 142
Kapnos 52
Kapurakachali 780
Kapurawalli 609
Kapur bhendi 174, 175
Kapurli 609
Kapur 93, 665
Kapur-kachri 780
,, madhura 653
Kar 464
Kara 591
Karabi 500
Karachi gum 281
Karafs 370
Karai 112
Karai-cheddi 409
Karai gond 73, 113
Karaila 62
Karalye 421
Karam 155
Karamardaka 507
Karamcha 507
Karam-i-dashti 878
Karanfal 328
Karanj 243
Karanja 243
Karanju 248
Karaunda 507
Karavella 340
Karavira 501
Karaviradya taila 501
Karawya *or* Karwaya 367
,, i-dashti 363
Karaz 281
Karachura 771
Kardayi 464
Karela 340
Karerua 526
Karfiyun 725
Karhi-nimb 130
Kari 597
Karid 389
Karihari 832
Karinda 507, 843
Karinga 361
Karinghota 147
Karintoomba 610
Karira 64
Karisha-langauni 430
Karit 338
Kariwana 361
Karivepachettu 130
Kari-wageti 133
Kariya-polam 823
Kariz 593
Karkata sringi 191
Karkol 624
Karkora 879
Karla 340
Karmat-el-baidat 878
Karmikara 38
Karonda 507
Karonta 553
Karonza 378
Karpasi 109
Karpo-karishi 216
Karpur 665
Karpura 665
Karpura-kachali 780
Karpushpu 764
Karrapu-damar 167
Karsanah 568
Karu-karkora 879

Karuna 134
Karunkanam 267
Karun shiragam 15
Karuntaka 590
Karuppuram 665
Karuvappu 328
Karuveppilai 130
Karvi 591
Karwa badam 292
  ,, bopla 349
  ,, indarjau 497
Karwand 507
Karwat 746
Karwaya, *see* Karawya.
Karwi 27
Karwi nai 353
  ,, turai 342
  ,, tumbi 349
  ,, wageti 133
Kasab-ed-darira 537
Kasaghini 717
Kas-el-himar 573
Kasai-bij 853
Kasamarda 260
Kash 854
Kashab-es-sini 838
Kashappu-vadam-kottai 292
Kashfa 149
Kashini-virai 461
Kashkash 39
  ,, -i-mansur 49
Kashmiri banafshah 66
Kashni 464
Kasiru 847
Kasisa 55
Kasni 461
Kasondi 262
Kasrat-el-azla 650
Kasturi-bhenda 102
  ,, manjal 769
Kasus 568, 754
Katai 636
Kataka 532
Kateri-indrayan 352
Katfit 629
Kath 283
Katha 283
Katha-el-himar 352
  ,, Hind 258
Kathal 749
Kathbel 142
Kathbol 285
Kathira 73
Kathir-el-rakab 657
Kathkaleja 248
Katidaus 786
Katil-el-kalb 527
Katira-i-Hindi 73
Katir-el-dam 807
Katkaranj 248
Kat-korandu 132
Katori 29
Katphala 749
Katrabungha 679
Katri 600
Katriwel 883
Katsareya 590
Katta kambu 283, 414
Kattamanakku 694
Kattrina 860
Kattu-iluppai 476
Kattuk kasturi 102
  ,, kodi 32
  ,, kol 267
Kattumannar 769
Kattup-pepudal 343
Kattu-shiragam 421
Katu-iriki 586
Katuka 577
Katuku-rogani 577
Katurohini 577
Katutumbi 349
Kaundal 345
Kaunphal 842
Kaur 577
Kaureya 497

Kavali 521
Kavath *or* Kavitha 482
Kavathenthi 235
Kavitha 142,
Kawale-che-dole 354
Kawun 113
Kayakuti-tel 331
Kayam 381
Kayappankottai 535
Kayaputi-ka-tel 331
Kazneh-i-dashti 851
Kazuri 403
Kee, *see* Ki.
Kekku-virai 367
Kekun oil 713
Kela 777
Kemuka 779
Keore-ka-mul 793
Kerni 482
Kesar 796
Kesaraja 431
Kesar-ki-roti 797
Kesri 73
Keu 779
Khadira 275, 283
Khair 281, 283
Khair-buva 786, 883
Khairchampa 508
Khairva 291
Khajkolti 717, 718
Khakar-na-gon 231
Khakshi 57
Khalbani 390
Khamjaria 645
Khanda kushmandaka 347
Khanderus 855
Khandesh opium 46
Khanik-el-kalb 527
  „ namir 6
  „ zeib 6
Khanno oil 756
Khaokurro 498
Khappar-kadu 526
Khappar-phodi 643
Khapra 75
Kharaki-rasna 519
Khardal 59
Khardi 569
Khar-i-shutr 219
Kharjura 801
Khark 513
Kharik 801
Kharoti 746
Kharzahrah 501
Khas 851
Khasak 119
Khasak-danah 464
Khashkhash, *see* Khaskhas.
Khaskhas 39, 851
Khatkhati 116
Khavi 851
Khaya-i-iblis 249
Khee-khowa 462
Khejra 281
Khersal 285
Khetpapra 403
Khilaf 732
Khilaf-el-Balkhi 731
Khillal mamuni 851
Khirkhejur 482
Khirva 704
Khitmi 96, 98
  „ -i-kuchak 98
Khiyar-i-khar 352
  „ shambar *or* chambar 258
Khoheil 811
Khokli 714
Khor 281
Khorasani ajwan 629
  „ omam 629
  „ owa 629
  „ yamani 629
Khoreti 746
Khubah 58
Khubazi 98
Khubkalan 57

Khulakhudi 361
Khulanjan 775
Khun-i-siyawashan 807
Khunsa 831
Khusru-daru 775
Khusyu-uth-thaalab 789
Kiasusi 53
Kichchilip-pazham 134
Kikar 282
Kilaippaik kizhangu 832
Kilan-ka-tel 758
Kil-daru 876
Kilkil 878
Kilz 671
Kinbil 709
Kinjal 323
Kinjalka 38
Kinna 393
Kinnab 734
Kino 240
Kinoin 242
Kinovin 490
Kirambu 328
Kiramal 243
Kiramar 679
Kirata-tikta 537
Kirath-i-jibali 619
Kirbut 350
Kirchak 629
Kirdamana 363
Kirfah 667
Kirfat-ed-darsini 667
Kirkundi 699
Kirmani owa 438
Kirni 409
Kiryat 582
Kishar kundur 149
Kishmish 184
Kishmish-i-kawaliyan 754
Kishniz 375
Kisht-bar-kisht 113
Kiwachh 229
Kizhkay-nelli 701
Knot-grass 659
Koat-komal 605
Kochai 286
Kochinda 829
Kochrik 883
Kodawah-porsh 177
Kodic-palay 524
Kodi-kakkatan-virai 558
Kohala 347
Kohl Farsi 289
,, kirmani 289
Kokam 78
Kokam butter 79
,, cha-tel 78
,, fruit 79
Kokanada 38
Kokilaksha 586
Kokli 127
Kolezan 183
Koli-che-chutar 594
Kolkanda 829
Kolkaphul 503
Kolluk-kay-velai 217
Kolsunda 585
Komal 378
Komri 255
Kongles 107
Konraik-kai 258
Koo, *see* Ku.
Koopamaynee 714
Korai 844
Koran-tutti 101
Koraphad 823
Korarima cardamom 884
Koratti 345
Koriyun 375
Koshataki 342
Kost-kulijan 777
Kosto 71
Kothmir 375
Kottak-karandai 426
Kottamalli 375
Kottai-mundiri 198

Kounti 131
Koura-sana 449
Kousso 296
Kovai 351
Kovidara 273
Kowaria 265
Kowit 142
Kramuka 802
Krishna chura 255
,, jiraka 15
,, kamboji 703
,, keli 657
Kshetraparpati 403
Kshiri 482
Kua 768
Kubja prasaran-taila 401
Kuchila 526
Kuchilalata 533
Kudari 346
Kuhili 229
Kukerwel 343
Kukshima 580
Kuksim 423
Kukubha 323
Kukura-chura 400
Kulahala 580
Kulaka 526
Kulapar 389
Kulappalai-virai 497
Kulhari 832
Kuliakhara 585
Kulijan 775
Kulinjana 775
Kulpasi 864
Kulu 112
Kuma 389
Kumbha 327
Kumbhraj 882
Kumkum 796
Kumra 347
Kundali 509
Kundel 397
Kunderu 289
Kundur 148
,, madahraj 149
,, unsa 149
,, zakar 149
Kunduru 149, 152
Kundurukam-pishin 152
Kungum-pu 796
Kunjad 289, 550
Kupaimeni 714
Kupanti 643
Kupa-veela 509
Kupilu 526
Kuppi 714
Kurak 64, 167
Kurantoli 339
Kurchi 497
Kurchila 526
Kurdu 655
Kureya 497
Kurfah 75
Kurfus 110
Kurki 524
Kurnah 593
Kurru 577
Kurru-chuntz 115
,, khajur 173
,, kutki 577
,, veylam 282
Kurruppu-maruta-maram 322
Kursingh 544
Kurtoli 339
Kurtum 464
Kuru-el-asafir 654
Kururundawan 336
Kuru-veylam 280
,, vingi 576
Kuruya, *see* Karawya.
Kurwi wageti 133
Kusar 475
Kushmanda 347
Kushta 449
Kushumba 464
Kusimb 167, 190

Kust-i-Arabi 450
,, bahri 450
,, shirin 452
,, talkh 452
Kusum 464
Kusumbah 464
Kusumbha 464
Kut 449
Kutaja 497
Kutakan 361
Kutchoo 773
Kutki 577, 580
Kut mitha 454
Kuttun 110
Kuzbura 375
Kyllingia monocephala 12, 853

Labiatæ 605
Lactuca sativa 459
,, remotiflora 462
Lagenandra 6
Lagenaria vulgaris 349
Lahori bachnab 3
Lai 289
Lajak 275
Lajalu 275
Lajri 275
Lakri-pashanbed or pakhanbed 795
Lakri-rewand-chini 660
Lala 48
Lal ambari 104
,, bahman 457
,, bherenda 697
,, chandan 237
,, chita 623
,, chitra 623
,, chitrak 623
,, jam 334
,, indrayan 345
,, mirch 640
,, safri am 334
Lallei 287
Lallemanantia Royleana 614
Laminaria saccharina 874
Lampooyang 771
Lamprachænium microcephalum 423
Lampuium 771
Langalika 832
Languli 832
Laricin 866
Larkimas 796
Las 874
Lasa *or* Lisha 757
Lasiosiphon speciosus 674
Lasora 570
Lataphatkari 187
Latak 120
Latakasturika 102
Launæa pinnatifida 461
Laung 328
Laurineæ 665
Laurus nobilis 672
Lavandula Stœchas 618
Lavang *or* Lavanga 328
Lavangap-pattai 667
Lavender 618
Lawala 845
Lawsonia alba 307
Lazak-el-dahab 393
Lebakh 147
Ledebouria hyacinthoides 834
,, maculata 835
Leea crispa 187
,, macrophylla 187
,, robusta 186
Lee, *see* Li.
Leguminosæ 209
Lemons 134
Lemongrass 852
Lemongrass oil 852
Lendi-pipli 728
Leonotis nepetæfolia 611
Lep 291
Lepidagathis cristata 594
Lepidin 56

Lepidium Iberis 55
„ sativum 56
Lettsomia nervosa 566
Lettuce 459
Leucas cephalotes 617
„ linifolia 617
Liane vermifuge 325
Libadiyun *or* Lifadiyun 621
Lichenes 864
Lign-aloes 674
Lignum colubrinum 534
Liliaceæ 823
Limbarra 173
Limonia acidissima 132
Limpaka 134
Limu 134
Lindenbergia urticæfolia 581
Lineæ 116
Lingur 600
Linoleic acid 118
Linoxyn 118
Linseed 117
Linseed oil 117
Linum usitatissimum 116
Lippia nodiflora 599
Liquidambar orientalis 313
Liquid storax 313
Liquorice 245
Lisan-el-hamal 650
Lisan-eth-thour 572
Lisan-el-asafir-el-murr 497
Lobelia nicotianæfolia 468
Lobeliaceæ 468
Lodh 489
Lodhra 489
Lodoicea seychellarum 804
Loganiaceæ 526
Loganin 531
Lopez root 129
London Rocket 57
Long pepper 721
Loni 76
Lonia 75
Loo, *see* Lu.
Loranthaceæ 754
Lot 817
Lotur bark 490
Loturine 490
Loturidine 490
Lotus flowers 38
Louz-el-murr 292
Luban 148, 485
„ javi 485
„ meyeti 150
Lubni 315
Luf *or* Lufa 353
Luffa acutangula 342
„ amara 342
„ echinata 343
„ tuberosa 341
Lufiniki 466
Lukrabo 67
Luntak 541
Lupinine 292
Lupinus albus 292
Lycium 35
Lym appel 483
Lythraceæ 304

Ma-el-khilaf 731
Mabli 62
Macaranga tomentosa 689
Mace 661
„ Bombay 664
Machoti 659
Macziwa ya watu wawili 811
Madalai 309
Madana 407
Madanaghanti 408
Madanmust 815
Madar 512
Madar-alban 518
„ fluavil 518
Madder 415
Madhuka 244, 476
Madhukarkatika 134

Madhukasara 476
Madhurika 273
Madhvi 475
Madmi 100
Magath-i-Hindi 671
Magiya-main 76, 78
Magnoliaceæ 22
Mahabala 99
Mahakala 345
Mahalib 295
Mahaliyun 725
Mahalung 134
Mahanaracha rasa 684
Mahanimba 172
Mahapus-woela 277
Maharukh 144
Mahatikta 582
Mahaushada 762
Mahferfin 11
Mahmudah 568
Mahruth 389
Mahudanah 691
Maida lakri 671
,, lakti 671
Maiden hair 700
Mail-kannai 255
Mainphal 406
Maiphal 729
Maize 855
Maizena 855
Maja 729
Majith 415
Majoon 737
Majuphal 729
Maka 430
Makadi 882
Makal 345
Makaranda 38
Makar-limbu 132
Makhana 38
Mukhmal 466
Makkai 855
Makka-sholam 855
Makki 840
Maklai-gond 277
Makoi 638
Malabari-pan-ki-jar 777
Malabar nut 584
Malai-tangi 99
Malai-vembu 171
Malai-veppam 171
Malait-tamara 839
Malakarunnay 129
Mala-kuli 360
Malbhok 777
Malilotus 211
Malippu 475
Malkangni 178
Mallotus philippensis 708
Malokia 98
Malvaceæ 96
Malva sylvestris 98
Malwa opium 45
Mamijwa 541
Mámirán 18
Mamitha 595
Manasij 689
Manattak-hali 638
Manda 843
Mandara 231
Mandukaparni 361
Manga-maram 196
Mangifera indica 196
Mango 196
Mangostan utan 483
Mangosteen 82
Mangostine 82
Manisurus granularis 856
Manjal 764
Manjishtha 415
Manjit 415
Manjitti 415
Manna of Alhagi 218
,, Calotropis 516
,, Tamarisk 77.
Man-sy-lan 821

Maphal 729
Mapursika 862
Maramanjal 34
Marandi 590
Mardarakht 55
Mardaru 878
Maredi 429
Margosa bark 170
Margosic acid 170
Margosine 170
Maricha 718
Marjadvel 563
Marjoram 618
Markatatinduka 526
Marking nut 203
Marmakhuz 572
Marmelos de Benguala 140
Marori 113
Marorphali 113
Marsh mallow root 97
Martynia diandra 555
Marrubium vulgare 619
Marudam-pattai 749
Maruk-kallan-kay 406
Marul 842
Marul kalung 842
Marutonri 307
Marvel of Peru 657
Marwa 618
Marygold 466
Mashik-kai 729
Mashipatri 434, 435
Masht-el-ghoul 101
Masina 116
Massandari 605
Mastaki 194
Mastich 194
Maswaigond 277
Matangnar 132
Matcho ya watu wawili 811
Mathiola incana 56
Matijer 611
Matisul 611
Matricaria Chamomilla 448
Matta-pal·tiga 564
Maua 476
Maulsari 480
Mauz 777
Mayer's solution 4
Mayir-manikham 99
Mazariyun 673
Mazarona 436
Mazeriyun-i-Hindi 235
Mazhu 244
Mazu 729
Mazuphal 729
Medical Indian opium 46
Meena harma 159
Meeta, *see* Mitha.
Meetiya 155
Mehak 244
Mehedi 307
Mehndi 307
Melaleuca leucadendron 331
Melanorrhœa usitatissima 595
Melanthin 16
Melanthion 15
Melastomaceæ 325
Melezitose 220
Melia azadirachta 168
  ,, azedarach 171
  ,, dubia 173
Meliaceæ 168
Melilot 211
Melilotus hamosa 211
  ,, alba 212
  ,, parviflora 212
Melissa 613
Memecylon edule 325
  ,, tinctorium 325
Menispermaceæ 25
Menispermine 28
Menphal 406
Mentha canadensis 617
  ,, incana 617
  ,, sylvestris 615

Menthol 617
Mera-munjil 34
Mera-singi *or* Medasinghi 521
Mersinghi 546
Meshasringi 522
Mesua ferrea 84
Methi 209
Methi modaka 209
Mezereon 673
Mhaisabol 158
Mhaisagugal 153, 159
Miah sayelah 313
Michelia Champaca 23
Micromeria capitellata 610
Mycrorhynchus sarmentosus 461
Milagay 640
Milagu 718
Milakaranai 129
Milem rama 428
Milh-el-tartir 184
Milk Hedge 694
Mimosa pudica 275
Mimusops Elengi 430
,, hexandra 482
Mindhal 406
Mingut 689
Mirabilis Jalapa 657
Mirchai 558
Mirio 672
Mirjoli 882
Miromati 659
Mishk-danah 102
Mishk-i-taramashia 613
,, i-zamin 686
Mishmi tita 18
Misreya 374
Mistletoe 754
Mitha-aqarqarha 876
Mitha kirayata 540
Mitha bish 6
Mobarkha 861
Mocha 106
Mochaka 777
Mocharas 106
Modira-caniram 533
Mogadam 480
Mogbira 610
Moghli-erendi 694
Mogra or Mogri 475
Moha 476
Mohra 476
Moka aloes 826
Mollugo stricta 75
Momordica Charantia 340
,, Cymbalaria 341
,, dioica 339
,, mixta 722
,, umbellata 346
Monetia barlerioides 509
Monora-mal 255
Mooda-cottan 187
Moo, *see* Mu.
Moranna 590
Morinda citrifolia 401
,, tomentosa 401
Morindine 402
Morindone 403
Moringa pterygosperma 206
Moringeæ 206
Morshikha 882
Morunghy root 207
Morwel 21
Mosambi chana 247
Motha 844
Mother cloves 330
Mothi-kuhili 230
Mothi-ringni 637
Mousse de Chine 868
Mowah oil 477
Mowrah flowers 476
,, oil 477
Mrinala 38
Muchur 655
Mucuna monosperma 230
,, pruriens 229
Muchukunda 114
Mudar 512

Mudarine 517
Muddi 402
Mudrika 49
Mududa 177
Mugrela 15
Mui 202
Muizak-i-asli 754
Mukhitah 570
Mukhu-ratai 655
Mukul 160
  „ -i-Arabi 160
  „ -i-azrak 160
  „ -i-yahud 160
Mukki 83
Mulabij 60
Mulatthi 244
Mul-ilava-maram 106
Muli-vayr 637
Mulli 637
Mulluk-kirai 652
Mullu-venga 716
Munakha 186
Mundi 426
Munditika 426
Munga-luppu 856
Munni-vayr 604
Muradsingh 113
Muraka 230
Murmuria 426
Murraya exotica 131
  „ Kœnigii 130
Murayin 131
Murrukkan-maram 231
  „ pishin 231
  „ virai 231
Murungai 206
Murva 842
Musa paradisiaca 777
Muscat garlic 841
Mushkak 860
Mushk bhendi-ke-binj 102
Mushli 819
Musht-ru 673
Musla-semul 106
Musli-kand 818
Mussænda frondosa 413
Musta 844
Mustaka 844
Mustard 58
  „ oil 59
Muteepal 145
Muthel 800
Muzz 302
Myrica sapida 749
Myricaceæ 749
Myristica malabarica 663
  „ moschata 661
Myristiceæ 661
Myrobalans belleric 320
  „ Chebulic 317
  „ Emblic 699
Myrrh 154
  „ Arabian 155
  „ Persian 155
  „ Siam 155
Myrsinaceæ 471
Myrtaceæ 326
Myrtus communis 335

Nachchuruppan 519
Nactamala 243
Nagabala 99
Nagadamani 435
Nagakuda 401
Naga-malli 588
Naga-mooghatei-kai 561
Naga-musadi 533
Nagara 762
Nagaranga 134
Nagarmotha 845
Nagarmustika 845
Nagchampa 84
Nagdown 435, 820
Naghzak 196
Nagkaria 832
Nagkesar 84

Nahi-kuddaghoo 61
Nakk-chikni 437
Nakpatar 556
Nallar 182
Nandruk 745
Nani-jangli-kando 834
Nan-i-kulagh 98
Nanjudan 146
Nankhwah 365
Nannari 509
Nanvachi-wel 643
Napelline 5
Napthylamine 749
Nara-dabba 134
Narak-karandai 355
Narakya-ud 748
Naral-cha-jhada 800
Narangi 134
Naranj 135
Narcissus Tazetta 837
Narcotine 45
Nardin 418
Nardostachys Jatamansi 417
Naregamia alata 174
Narikela 800
Naringin 138
Narjil bahri 804
Narjil-i-daryai 804
Narikel-gachh 800
Nari-vengayam 829
Nariyal-ka-per 800
Narkachura 773
Narki-cha-kanda 879
Narlaung 328, 330
Narthex Asafœtida 385
Naruvilli 570
Narvala 62
Narwel *or* Narvel 603, 604
Nasona 547
Nata 248
Nataloin 829
Nattam-takarai 262
Nattavil 747
Nattuvadam-kottai 320
Nauclea Cadamba 409
,, cordifolia 409
Navananji-cha-pala 468
Navel 333
Nawal 566
Nayaphatki 187
Nayavaylei 61
Nayeti 693
Naypalai 519
Na-yurivi 651
Nee, *see* Ni.
Negro coffee 262
Nelumbium speciosum 37
Nemuka 29
Nepali-dhania 128
Nepaline 4
Nepenthe 629
Nepeta ciliaris 612
Neri-arishippal 313
Nerija 179
Neriodorein 502
Neriodorin 502
Nerium odorum 500
Nerunji 119
Nervalam 684
Nervalam-unnay 685
Nevadunga 690
Newarang 689
Ngai camphor 95
Nhyu 409
Nibendj 629
Nibhalkand 881
Nicotiana Tabacum 632
Nicotianin 634
Nicotine 633
Nigella sativa 15
Niger seed 433
Nil 213
Nila 213
Nilak-kadalai 246
Nilam 213
Nilap-panaik-kizhangu 818

Nila-vembu 536, 582
Nila-virai 268
Nilkanth 773
Nilufer 38
Nim 168
Nimar oil 847
Nimba 168
Nimbarra 173
Nimbuka 134
Nimurdi 427
Nindo-trikund 120
Nir *or* Ner 882
Nirbishi 11
Nir-brami 579
Nirgari 600
Nirgundi 600
Nirija 179
Nirmali 532
Nirmulli 585
Nir-nochchi 600
Nirumel-neruppu 304
Nirvishi 12, 853
Nisan 764
Nishotar 556
Nisinda 600
Nisot 556
Niwal 694
Niwali 532
Noona 402
Notonia grandiflora 463
Nukhud-i-alwandi 681
Nuna-maram 401
Nutmegs 661
Nux-vomica 526
Nyaphatki 187
Nyctaginaceæ 655
Nyctanthes Arbor tristis 473
Nymphœa 38
Nymphæaceæ 37

Ochrocarpus longifolius 85
Ocimum basilicum 606
  „ gratissimum 607
Ocimum pilosum 606
  „ sanctum 606, 614
  „ species 614
Odi 183
Odina Wodier 202
Odiya maram 202
Oil, *see* Oleum
Olaktambol 114
Oleaceæ 473
Oldenlandia corymbosa 403
  „ umbellata 404
Oleander 501
Olencha 852
Oleum ajwan 366
  „ anacardii 199, 201
  „ andropogi 847
  „ anethi 374
  „ anisi 23
  „ arachis 247
  „ argemone 50
  „ azadirachtæ 168, 171
  „ bassiæ 478
  „ cajuputi 331
  „ calophylli 86
  „ camphoræ 95
  „ caryophylli 329
  „ celastri 178
  „ cinæ 441
  „ cinnamomi sinensis 668
  „ coriandri 375
  „ crotonis 684
  „ cubebæ 725
  „ dipterocarpi 88
  „ fœniculi 372
  „ garciniæ 79
  „ gossypii 112
  „ gynocardiæ 68
  „ hydnocarpi 72
  „ jatamansi 419
  „ jatrophæ 695
  „ lini 116
  „ melissæ indicæ 852
  „ menthæ canadensis 617

Oleum mesuæ 84
 „ myristicæ 663
 „ „ expressum 663
 „ nigrum 178
 „ nucis indicæ 800
 „ papaveris 42
 „ ricini 704
 „ rosæ 299
 „ rutæ 124
 „ santali albi 751
 „ semecarpi 204
 „ sesami 549
 „ sinapis 59
 „ terebinthinæ 756
 „ tiglii 684
 „ verbenæ 852
Olibanum 148
Olikiryat 582
Omam 365
Onagraceæ 325
Onosma Hookeri 574
Oo, *see* U.
Ooghai-puttay 624
Opaque bdellium 155, 161
Ophelia augustifolia 540
 „ Chirata 536
 „ multiflora 540
Ophelic acid 539
Ophioxylon serpentinum 505
Opium 39
Opium, Abkari 46
 „ analysis 46
 „ Behar garden 46
 „ eating 42
 „ Egyptian 46
 „ English 47
 „ Khandesh 46
 „ Malwa 45
 „ Medical, Indian 46
 „ Persian 46
 „ Sind 46
Oranges 134
Orcanette 574
Orchidaceæ 789
Orchis 789
Origanum Marjorana 618
Orila tamaray 66
Oroxylum indicum 547
Orris camphor 794
Orris root 793
Osari 430
Oschak 393
Otto of Roses 299
Oufa 107
Ouplate 449
Ovali 480
Owa 365, 608
Oxalis corniculata 121
Oxycannabin 739

Pachchai-alari 503
Pad 546
Padal 545
Padi 780
Padma 37
Padma kasta 295
Padmini 38
Padri 545
Padshah salep 791
Pæderia fœtida 400
Pæonia albiflora 453
 „ corallina 17
 „ officinalis 17
Pagala-mullai 473
Pahad 546
Paharikanda 834
Paharmul 29
Pair 744
Pakhanbed *or* Pashanbed 543, 795
Pakku 802
Pala 576
Palak-juhi 588
Palanggini 856
Palan-kizhangu 771
Palas 231
Palasa 231

Palasa gonda 231
Palasha-pishin 231
Palas-ki-gond 231
Palas papra 231
Palas-wel 234
Palita-mandar 230
Palla 482
Palmæ 800
Palo 31
Palo de Culebra 510
Palupaghel-kalung 339
Palwal or Parwar 344
Pan 727
Panai-maram 801
Panam-palca 663
Pan-ki-jar 774
Panalavanga 325
Pana salt 812
Panarnava 655
Panchavalkala 743
Pandhara adulsa 585
,, babhul 281
,, kura 497
,, peru 334
,, poti-akola 880
,, saur 106
Pandhari 684
,, esesh 150
,, luban 150
,, miri 718
Pandruk 112
Pangla 609
Pangra 230
Paniala 74
Panichekai 483
Pani-ki-sambhalu 600
Panir-band 645
Panir-ja-fota 645
Panjangusht 600
Panjira 609
Panjoli 703
Pankhraj 876
Pankul 410
Panmohuri 372
Panwar 265
Pao de cobra 534
,, merda 749
Pao sujo 749
Papai 356
Papaine 359
Papat 400
Papaver Rhæas 48
,, somniferum 39
Papaveraceæ 39
Papaw 356
Papita 535
Papiya 356
Pappali-maram 356
Pappana 400
Papri 748
Para cress 434
Parajatak 473
Paral 546
Paramenispermine 28
Paramygnia monophylla 133
Parangi-shambirani 148
Parasika 629
Paras-pipal 105
Pareira 29
Paribadhra 130
Paricine 405
Parijata 231
Paringay-puttay 838
Parin-kaka-vully 276
Paripat 403
Parisa 105
Parmelia kamtschadalis 864
,, perforata 864
,, perlata 864
Parna-bij 360
Parnaksh 393
Parnasa 606
Parpata 403
Parpo 717
Parsiawashan 862
Partak 473

Part-bikhta 7
Parul 546
Paruthi 109
Parwar *or* Palwal 344
Parwel 32
Pashanabhedi 608
Pashmaram 20
Passelie-keeray 75
Passifloreæ 356
Pastinaca grandis 379
„ Secacul 398
Pata 29, 99
Patala 546
Patala-gandhi 505
Pataltumri 878
Patang 251
Patchak 449
Pato de jujubes 180
Patha 29
Pathar-ka-phul 864
Pathmapu-todami 561
Pathri 461
Pathurchur 608
Patola 344
Patwa 104
Pava-kai 340
Pavana 703
Pavetta indica 400
Pavonia odorata 109
Pavuttay-vayr 400
Pechak 113
Pedalineæ 549
Pedalium murex 553
Pee inota inodien 643
Pee, *see* Pi.
Peela bhangra 431
Peelcolli 588
Peganum Harmala 124
Pelosina 30
Pelletierine 312
Pellitory 444
Pendari 406
Pentgul 236
Penva 779
Pepita 535
Pepper, black 718
„ long 722
„ white 718
Peppermint 617
Peramutiver 109
Pera-virai 260
Peristrophe bicalyculata 594
Persian gum 294
„ myrrh 155
„ opium 46
„ lilac 172
Perumarindu 678
Perumaruttoo-puttay 144
Peru-nerunji 553
Perungayam 381
Perunshiragam 377
Petari 100
Petguli 236
Petha 347
Peucedanum grande 379
Peule-kosht 764
Peyameratti 610
Pey-komatti 336
Peyp-palai 519
Phœnix sylvestris 801
Phanas 749
„ alombe 868
Phanasamba 868
Phansula 749
Phal-modecca 564
Phalphura 547
Phand 562
Phangla 609
Pharbitisin 560
Pharbitis Nil 558
Phatara suva 433
Phattersalam 379
Phenila 188
Phokar-mul 452, 454
Pholidota imbricata 791
Phopeti 643

Phutkari 556
Phurwin 883
Phyllanthus Emblica 699
„ madraspatensis 703
„ Niruri 701
„ reticulatus 703
„ rhamnoides 708
„ urinaria 701
Physalis Alkakengi 646
„ indica 643
„ minima 643
Piaranga 20
Piasal 322
Piazi 831
Picrorhiza Kurroa 577
Picrotin 29
Picrotoxin 28
Pigavi 178
Pikapiru 703
Pila 749
Pila-kanir 503
Pili-jari 20
Pilpapra 276
Pilpil 719
Pilu 624
Pimpinella anisum 377
Pinang 802
Pindie-conda 653
Pinhoen oil 697
Pinlang 802
Pinus Deodara 757
„ longifolia 756
Pipal 743
Piperaceæ 718
Piper Betle 727
„ Cubeba 724
„ longum 721
„ nigrum 718
„ officinarum 721
„ Roxburghii 721
„ trioicum 721
Piperic acid 721
Piperidin 721
Piperin 720
Pipla-mul 722
Pipli 722
Pippali 722
Pippali-mula 722
Pirandai 182
Pirang 212
Pisa 671
Pisatela 671
Pisonia morindifolia 656
Pistacia cabulica 194
„ integerrima 191
„ Khinjuk 194
„ Terebinthus 194
Pistia Stratiotes 811
Pitachandana 237, 751
Pitcha-pullum 350
Pitmari 519
Pitohri 556 [433, 593
Pit papra or Pitta papada 52, 175,
Pitvan 221
Pit-wel 174
Pityel 175
Pivala-chapha 23
„ tilavana 61
Piyaz-i-dashti 830
Pizpaz 389
Pladera decussata 542
Plantaginaceæ 648
Plantago Ispaghula 648
„ major 650
„ ovata 648
Plantain 777
Pluchea lanceolata 449
Plumbagin 622
Plumbagineæ 620
Plumbago coccinea 623
„ zeylanica 620
Plumeria acutifolia 508
Poa cynosurioides 854
Podootalei 599
Pogostemon parviflorus 609
„ purpuricaulis 609

Poinciana pulcherrima 255
Pokli-miri 721
Polenta 855
Polianthes tuberosa 832
Polychroit 797
Polygonaceæ 657
Polygonum aviculare 659, 661
,, glabrum 659
Polypodium quercifolium 532,863
,, vulgare 860
Polyporus officinalis 865
Pomegranate 309
Pomelo *or* Pummelo 138, 139
Pongamia glabra 243
Ponna-virai 260
Ponnan-kottai 188
Poodacarapan 748
Poo, *see* Pu.
Poon 87
Popato 403
Poput-buti 575
Poppy capsules 48
,, oil 42
,, seeds 42
Porosan 231
Porphyra vulgaris 874
Portulaca oleracea 75
,, quadrifida 75
Portulaceæ 75
Poshkar 454
Post 39
Postaka tol 39
Potentilla supina 304
Pothos pertusa 812
Prachinamalaka 74
Prangos pabularia 378
Prasaran 400
Prasarani 400
,, leha 401
Prashni 811
Premna integrifolia 604
Prisniparni 221
Prunes 244
Prunus bokhariensis 294
,, Mahalib 295
,, Pudum 295
,, spinosa 295
Pseudo-aconine 5
,, -aconitine 5
,, -indican 505
Psidium Guyava 334
Psoralia corylifolia 216
Pterocarpin 239
Pterocarpus Marsupium 239
,, santalinus 237
Pterospermum acerifolium 114
,, suberifolium 114
Ptychotis Ajwan 365
,, Roxburghiana 378
Pudina 615, 617
Pueraria tuberosa 234
Puga 802
Pugai-ilai 632
Pulavayr-puttay 703
Pulcolli 588
Pulipandak 506
Puliyam-pazham 270
Puli-yarai 121
Pumadalai 309
Pun 843
Punag 85
Punagam 86
Punai 87
Punaik-kali 229
Punanarva 655
Punanavashtaka 656
Pundarika 38
Pungam-maram 243
Punica Granatum 309
Punico-tannic acid 311
Pupal 802
Purasha-maram 105
Purslane 75
Puta-tanni-maram 327
Putikaranja 249
Pyrethrin 434, 446

Pyrus Cydonia 302

Quercus infectoria 729
Quince 302
Quisqualis indica 324

Radix Abri 223
„ Aconiti 1
„ „ heterophylli 6
„ Althææ 96
„ Berberis 35
„ Calumbæ 25
„ Chinæ 838
„ Coptidis 18
„ Gentianæ 543
„ Glycyrrhizæ 244
„ Gossypii 110
„ Granati 309
„ Hemidesmi 509
„ Junci 844
„ Lopeziana 129
„ Mustela 506
„ Pareiræ 29
„ Puloronica 678
„ Pyrethri 444
„ Rhei 660
„ Satyrii 789
„ Serpentariæ 109
„ Toddaliæ 130
„ toxicaria 821
„ Tylophoræ 519
„ vesicatoria 623
Ragat-chandan 237
„ rohini 880
Rahishi 550
Raisins 184
Raiz de Cobra 678
Rajadani 482
Raja jira 115
Rajan 482
Rajanigandha 832
Rajanikasa 473
Rajataru 258
Rajika 59
Rajputaka 646
Rakas-gaddah 353
Rakta-chandan 237
„ chitraka 623
„ rohida 181, 659
„ simul 106
„ vinduchada 693
Ral 92
Rala 92
Ramabana 843
Rambha 777
Rametha 674
Rampatri 663
Ram til 432
Ram-tulsi 607
Ramturai 103
Ran-aboli 592
Randhani 378
Randia dumetorum 406
„ uliginosa 406
Rang 614
Rang-i-badshah 573
Rangun-ki-bel 324
Ran-halad 769
Ran-jai 21
Ran-limbu 132
Ran-makkai 853
Ran-parul 343
Ran-phanas 749
Ran-takla 260, 262
Ran-tikhi 57
Ran-tondla 351
Ran-tulsi 607
Ran-turai 342
Ranunculaceæ 1
Raphanus sativus 60
Rasamala 314
Rasan 450
Ra-sana 449
Rasimilious 315
Rasin 254
Rasna 792

Rasnapanchaka 792
Rasot 35
Raswanti 35
Ratamba sala 78
Ratanhia 186
Ratanjli 237
Ratanjot 574
Ratanpuras 66
Ratoliya 599
Raughan-i-bed 732
Rauwolfia serpentina 505
Razianah *or* Razianaj 373, 377
Rechanaka 708
Red Sandal wood 237
Red Sanders wood 239
Renuka-bij 602
Rhædine 49
Rhamneæ 180
Rhamnus Wightii 181
Rhazya stricta 496
Rhein 261
Rhetsa maum 127
Rheum species 660
Rhinacanthin 589
Rhinacanthus communis 588
Rhododendron lepidotum 759
Rhubarb 660
Rhus coriaria 192
  ,, Kakrasingi 191
  ,, parviflora 194
Rhynchocarpa fœtida 355
Ribas 660
Ricinelaidic acid 707
Ricinelaidin 706
Ricinine 707
Ricinoleic acid 706
Ricinus communis 704
Rijl-el-ghurab 878
  ,, jarad 758
Ringanwel 883
Ringin 188
Ringni 636
Rishah-i-khitmi 96
Ritha 188
Rivea ornata 562
Riwas 660
Rohan 175
Rohida 408
Rohish 860
Rojamari 428
Rosaceæ 292
Rosa canina 298
  ,, damascena 298
Rose malloes 314
  ,, stamens 298
  ,, water 299
Roselle 104
Roses 298
Roshel 847
Rosin 92
Rosmelleus 77
Rostellularia procumbens 591
Rottlerin 711
Rourea santaloides 208
Rubiaceæ 400
Rubia cordifolia 415
  ,, tinctorium 415
Rue 122
Rui 512
Rukha 747
Rumex vesicarius 658
  ,, Wallichii 661
Rumman 309
Runas 415
Rungia parviflora 594
  ,, repens 594
Rus 851
Rusa 847
Rusa-ka-tel 847
Rusta 456
Rutaceæ 122
Ruta graveolens 122
Ruvuka 704

Saalab-misri 789
Sabaat azlaa 650

Sabzi 732
Saccolabium papillosum 792, 793
Sadaj-i-Hindi 670
Safarjal 302
Safed bahman 456
„ dhatura 626
„ jam 334
„ kikar 281
„ mirch 718
„ miri 718
„ musli 840
„ safri-am 334
Safflower 464
Saffron 796
Safsaf 732
Sagapenum 396
Sagapu 404
Sagbinaj 396
Sagun 595
Sagwan 595
Sagurghola 248
Saghurghota 248
Sahadevi 423, 430
Sahjna 206
Saint Ignatius' Bean 535
Saj 595
Sajikhar 654
Sajira 368
Saka 595
Sakalabi 160
Sak-el-hamam 25
Sakhis or Sakhees 851
Sakkar-el-ushar 516
Sakmuniya 567
Sakoh 92
Sal 92
Sala 92
Sal absinthicum 437
Salai 152
Salaki 152
Salam-misri 789
Sale-gond 152
„ lassa 152
Salep 789
Salicineæ 731
Salicornia 653
Salix caprea 731
„ tetrasperma 732
Salmali 106
Salparni 222
Salsola 653
Salvadora oleoides 626
„ persica 624
Salvadoraceæ 624
Salvia plebeia 611
Salwan 222
Samandar-sokh 566
Samgh-i-arabi 277
„ -i-bal-i-shirin 393
Samrat-el-asl 78
„ et-turfah 76
Samadera indica 147
Samaderin 148
Sambhalu 602
Sambucus odorata aromatica 604
Samudra-shokh 566, 611
Samundar-phal 326
Samutra-pullam 326
Sana baladi 264
„ hajazi 269
„ jabali 264, 269
„ maki 268
Sanakhurd 467
Sandal 752
Sandalwood 751
„ oil 752
Sandarus 291
Sandesha 255
Sandesra 255
Sangisaboyah 265
Sangkhaphuli 509
Sangkhi 509
Sanipat 580
Sanjisaboyah 265
Sankahul 572
Sankhini 582

Sankar-jata 221
Sankhahuli 542
Sankhapushpi 542
Sanseviera zeylanica 842
Sant 281, 655
Santal 238
Santalaceæ 751
Santalum album 751
Santolina Chamæcyparissus 615
Santonin 440
Sapanwood 252
Sapindaceæ 187
Sapindus trifoliatus 188
Sapistan 570
Sapogenin 190
Saponin 190
Sapotaceæ 476
Sapota plum 482
Sapotannic acid 482
Sapotilla bark 482
Sapotine 482
Sapsan 678
Saptaparna 491
Sapus 678
Saraca indica 257
Sarakhs 876
Saral 756
Sarala 756
  „ drava 756
Sarcocolla 288
Sarcocolline 289
Saresh 831
Sarifun 438
Sari-kasondi 260
Sariva 510
Sarivadvaya 510
Sarivan 222
Sarjikakshara 653
Sarpagandha 505
Sarpan-ka-tel 86
Sarphoonka 217
Sarpunkha 217
Sarv-i-Turkistani 759
Sarwali 655
Sarzaparilla, country 839
Satar 616
  „ bari 758
  „ el-hamir 619
Satali 398
Satawri 398, 840
Sathi 611
Sat-i-giloe 31
Satphal 326
Satureia græca 612
Saturiyun 789
Sáturyus 11
Satyrion 11
Satwin 491
Saunf 377
Saur 106
Saurab 796
Sauromatum pedatum 817
Saussurea Lappa 449
Savali 398
Sazaj-i-Hindi 670
Scammony 567
Scherubala 653
Schetti codiveli 623
Schweinfurthia sphœrocarpa 580
Scilla hyacinthoides 834
Scindapsus pertusus 812
Scirpus Kyssoor 847
Scitamineæ 762
Scopolia aculeata 129
Scorodosma fœtidum 385
Scrofulariaceæ 577
Sea cocoanut 804
Sebestens 570
Securinega leucopyrus 717
See, *see* Si.
Segun 595
Sehund 689
Selu 570
Semicarpus Anacardium 203
Sempsen 550
Sendi 801

Sendri 73
Sendu-bir-kai 342
Senna 264, 268
Seoti 448
Sephalika 473
Serinji 306
Sesamum indicum 549
Sesban 254
Sesbania ægyptiaca 254
  „ grandiflora 253
Sethia indica 892
Sewur 496
Shadharanayoga 620
Shafterak 58
Shahdaneh 734
Shahterah 52
Shak 393
Shakakul 398
Shakakul-i-misri 398
Shala mishiri 789
Shalim 860
Shallatu-virai 459
Shalumbi 58
Shamantippu 448
Shamariniyun 371
Shambalid 835
Shambhalu-ka-bij 602
Shambirani 485
Shami 285
Shamkand 7
Shampangi 23
Shamraj 880
Shamuddirap-pachchai 566
Shandanak-kattai 751
Shankeshvara 458
Shankhavalli 564
Sharab-i-kashkash 42
Sharak-konraik-kai 258
Sharfiyun 786
Sharifah 24
Shatakuppi-virai 374
Shaukat-el-arabiya 657
  „ baida 466, 657
Shavaka 77
Shavari-pazham 345
Shayakah 289
Sheeakai 286
Shee, *see* Shi.
Shegat 206
Shegva 206
Shemakalengu 817
Shembi 285
Shem-maram 175
Shemmuli 590
Shencoodie vaylie 623
Shendorwel 843
Shengankuppi 598
Shen-kottai 203
Shen-shandanam 237
Shepu 374
Sheran-kottai 203
Sherus 58
Sherusel 58
Sherus-ka-tel 58
Shevari 254
Shevelli 415
Shewan 599
Shial-kanta 50
Shibab 691
Shibbit 374
Shib-jal 187
Shih 438
Shika 286
Shikam-daridah 649
Shikani 437
Shimai agatti 266
Shimai-kich-chilik-kizhangu 780
  „ madala-virai 302
  „ shombu 367
Shimpti 202
Shindil-kodi 30
Shiragam 369
Shirat-kuchchi 536, 582
Shir-el-jibal 862
  „ jinn 862
Shiru-kurunja 521

Shiru-nari-vengayam 834
Shitaraj 621
Shitta-rattai 774
Shivadai 556
Shivappu-goyya-pazham 334
Shivappu chittira 623
Shivardole 413
Shivika 721
Shiwaran 58
Shombu 377
Shopha 374
Shora-kai 349
Shorea robusta 92
Showkran 363
Shoyikirai-virai 374
Shud 374
Shuka 875
Shukai 657
Shukku 762
Shumshur 786
Shumach 192
Shuniz 15
Shushma 786
Shushmir 787
Shuthi 771
Shwet-basanta 714
Siah, *see* Siyah.
Siah-zirah 368
Siali 235
Siam benzoin 486
,, myrrh 155
Sida carpinifolia 99
,, cordifolia 99
,, rhombifolia 99
,, spinosa 99
Sidharta 58
Siddhi 732
Sidori 525
Sikekai 286
Silajit 540
Silaka 315
Silaras 313
Silphium 378, 381
Simarubeæ 144
Simsim 550
Simul 106
Sind opium 46
Sindhuvara 600
Singhrukh 791
Sinjad 723
Sinjid-i-jilani 180
Sipand 124
Sira-shengalanir 423
Sirpoon 87
Sirru-kanchori-vayr 717
Sirru-pulay-vayr 653
Sisymbrium Irio 57
,, officinale 57
Sitaphal 24
Sitapullum 24
Sittarittee 780
Siuli 473
Sium Ninsi 399
Siyah, *see* Siah
Siyah danah 15
Sleichera trijuga 190
Smilax China 838
,, glabra 838
,, ovalifolia 839
Snehaphala 549
Snuhi 689
Soapnut 188
Sobhanjana 206
Socotra Dragon's blood 810
Scotrine aloes 825
Soda plants 653
Solanaceæ 626
Solanidine 639
Solanine 639
Solanum Dulcamara 638
,, indicum 637
,, Jacquinii 636
,, nigrum 638
,, xanthocarpum 636
Solinicine 639
Somballi 717

Somraj 421
Somraji 400, 421
Sonamaki 268
Sonarwel 883
Sondhali 258
Sondhi 851
Songarvi 230
Sonsali 429
Sont 762
Sonth 762
Soo, *see* Su.
Sopubia delphinifolia 581
Sothagni 655
Souf-el-ard 619
Sowa 374
Soymida febrifuga 175
Spathodea falcata 546
Spermacoce hispida 408
Sphærococcus compressus 868
  „ lichenoides 872
Spheranthus indicus 426
Spilanthes oleracea 434
  „ Acmella 434
Spin-bajja 645
Spogel seeds 649
Spondias mangifera 205
Squill 830
Sri-hastini 574
Srikhanda 237, 751
Sringavera 762
Sringibish 6
Star-anise 22
Statice ægyptiaca 624
Stemodia ruderalis 581
Sterculiaceæ 112
Sterculia urens 112
Stereospermum chelonoides 545
  „ suaveolens 546
  „ xylocarpum 544
Storax 313
Strobilanthes ciliatus 591
Strunt-hout 748
Strychnine 529, 536
Strychnos colubrina 533
  „ Ignatii 535
  „ Nux-vomica 526
  „ potatorum 532
Styraceæ 485
Styrax Benzoin 485
Suad 844
Suæda 653
Sudab 122
Sufed, *see* Safed
Sugandha bala 109
  „ marichu 724
Sughandi puri 418
Sukanu 879
Sukha-biroza 152
Sukhdarsan 820
Sukkapat 509
Sult 859
Sultan champa 86
Sumak 192
Sumatra benzoin 487
Sumbul 418
  „ Bombay 394
  „ i-Hindi 418
Sum-el-himar 501
Sunanda 678
Sung-elley 509
Sunti 762
Supari 802
Supari-che-phul 802
Supari-ka-phul 106
Superbine 834
Sural 235
Surasaruni 708
Surband 435
Surdan 58
Suringi 85
Surinjan 835
Surinjan-i-shirin 836
  „ talkh 836
Suriya 851
Surjanwari 881
Surjavarta 62

Surson 58
Surson-ka-tel 58
Surugen 835
Suryavarti 717
Sus 244
Susan 793
Susani 794
Susan-i-asmanjuni 794
Suseman 550
Sushavi 340
Sutap 122
Suva 374
Suvarnaka 258
Svalpa-methi-modaka 209
Sveta-maricha 206
  ,, punarnaba 655
  ,, punarnava 75
Sweet Chiretta 540
Swertia angustifolia 540
  ,, Chirata 536
  ,, decussata 540
Switch sorrel 191
Symplocos Beddomii 489
  ,, racemosa 489
Synantherias sylvatica 816
Syonaka 547
Syrian nard 420

Tabasheer 857
Taftaf 188
Tagada 545
Tagarai 265
Tagetes erecta 466
Tagger 419, 676
  ,, ganthoda 419
Taindu 480, 485
Taizbul 724
Taj 667
Tajpat 670
Takla 265
Takmaki 339
Takmeria 606
Tal 549, 801
Tala 801
Talaa 777
Talashrooli-vayr 678
Talib-el-khubz 365
Talimkhana 585
Talisadya churna 758
Talisfar 498, 759
Talishpatra 758
Talispatr 758
Talmakhara 585
Tamarix articulata 78
  ,, gallica 76
Tamar-i-Hindi 271
Tamarind 270
Tamarindus indica 270
Tamariscineæ 76
Tamarisk manna 77
Tambaku 632
Tambra nagkesar 85
  ,, peru 334
  ,, pushpi 306
Tambul 728
Tambula 727
Tamruj 179
Tanduliya 652
Tannate of cannabin 741
Tannic acid 730
Tannin 730
Tanrik-kay 320
Tar 801
Tarali 346
Taranjabin 218
Taraxaco 462
Tarbuj 350
Tarbuz 350
Tarmuj 350
Tarthuth 393
Tarwar 264
Tashmizaj 267
Tatrak 192
Tatulah 627
Tavakhir 768
Taxine 761

Taxus baccata 758
Teak 595
Tectona grandis 595
Tee, *see* Ti.
Tejbul 879
Tejpat 670
Tejpatra 670
Tejraj 881
Tekku-maram 595
Tela kucha 351
Teliya bachnag 1
Tel-kodduki 574
Tellicherry bark 498
Ten-atti 745
Tenna-maram 800
Tentul 270
Teo 592
Teori 556
Tephrosia purpurea 217
Terminalia Arjuna 323
  „ bellerica 320
  „ Catappa 321
  „ Chebula 317
  „ paniculata 323
  „ tomentosa 322
Tessul 127
Tetano-cannabine 741
Tetran-kottai 532
Tetranthera apetala 672
  „ laurifolia 671
Tetu 547
Teucrium Polium 615
Thalictrum foliolosum 20
Thalkuri 361
Thanmori 643
Thao 870
Thespesia populnea 105
Thevetia neriifolia 503
Thevetine 505
Thohar 689
Thum-el-barri 841
Thor 694
Thus Libycum 393
Thuth 454
Thyme 619
Thymelæaceæ 673
Thymol 366
Thymus species 509
Tiaridium indicum 574
Tibn Makah 851
Tib-el-gharib 851
Tid-danda 346
Tienhiung 13
Tiglinic acid 687
Tikhur 768
Tikta-lau 349
Til *or* Tila 549
Tilavana 62
Tiliaceæ 115
Tillaka 489
Timbiri 483
Timmue 724
Tindisa 103
Tinduka 483
Tinospora cordifolia 30
Tinpana 174
Tipani-kand 880
Tiphan-kand 880
Tintidi 270
Tippili 722
Tippilimulam 722
Tirapa 212
Tirmis 292
Tiruvach-chip-pu 503
Tiryak 39
Tisi 116
Tita-indarjau 497
Tita-kunga 524
Titabli 236
Tiwaj 498
Tiwas 234
Tiwat 234
Tjana-kua 779
Tobacco 632
Tobacco camphor 634
Toddalia aculeata 129

Toddalia lanceolata 129
Todri 56
Tommon bezaar 770
„ itam 773
„ primum 770
Tondli 351
Tong-pang-chong 589
Too, *see* Tu.
Toppi 700
Tordylium Secacul 398
Torenia asiatica 581
Total-vadi 275
Towdri 55
„ black 56
„ red 56
„ white 56
Tozeri 55
Trachylobium Hornemannianum [291
Tradescantia axillaris 842
Tragacanth 73
Tragia cannabina 717
„ involucrata 718
Trapa natans 119
Trayamán 14
Tree Turmeric 34
Trianthema obcordata 74
Tribulus alatus 120
„ terrestris 119
Tricholepis glaberrima 467
„ procumbens 466
Tricosanthes cucumerina 343
„ laciniosa 344
„ palmata 345
Trifolio 174
Trigonella corniculata 212
„ Fœnum-Græcum 209
Trikanta-juti 509
Trikatu 718, 762
Trimada 620
Trinaraja 801
Trinpali 856
Tripakshi 576
Triphal 127
Triphala 320
Tripunkhi 576
Triputa 556
Trivrit 556
Tsietti-mandaru 255
Tsjovanna-amelpodi 505
Tuberose 832
Tubocuty 100
Tukati 99
Tukm-i-anjudan 381
„ aspast 879
„ balasan 164
„ balung 614
„ gul 298
„ kafshah 464
„ kahu 460
„ kajrah 464
„ kasus 569
„ kazirah 464
„ khitmi 96
„ nil 558, 562
„ panjangusht 602
„ rihan 606
„ sarmak 879
„ sarwali 655
„ tokhra 363
Tulashi 605
Tulasi *or* Tulsi 605
Tulati-pati 643
Tultuli 525
Tumatti 336
Tumba 617
Tumbi 349
Tumbilik-kai 483
Tumos 619
Tumri 128
Tun 177
Tunu-maram 177
Tupkaria 99
Tupwel 881
Turbith 557
Turbud 556
Turkhani 445

Turkhun 444
Turmeric 764
Turmerol 768
Turmus 292
Turpentine 756
Turpethic acid 558
Turpethine 558
Turpetholic acid 558
Turphullon 789
Turrœa villosa 175
Turun 181
Turunj 134
Tutti 100
Typhaceæ 843
Typha angustifolia 843
Tylophora asthmatica 519
„ fasciculata 521

Ud 485, 674
Uda-jati 592
Udasaliyun 371
Ud-el-bark 750
„ karih 444
„ jibbali 444
„ waj 813
Ude-sálam 17
Ud-i-balasan 164
„ bari 876
„ gharki 675
„ kham 675
Udifarunas 734
Ud-sálap 17
Udumbara 744
Ularnda-dirakshap-pazham 184
Ulatkambal 115
Ullar-billar 33
Ulmus integrifolia 748
Ulva latissima 874
Umattai 626
Umbar 744
Umbelliferæ 361
Uncaria acida 413
„ Gambier 413
Undarbibi 697
Undi 86
„ che tel 86
Undira-cha-kan 462
Undirkani 566
Unmatta 626
Unnab 180
Upercao 510
Upersara 509
Uraria picta 221
„ lagopoides 221
Urenne 748
Urginea indica 829
Urostigma volubile 746
Uruk-es-sabaghin 765
Uruk-es-sufr 765
Urticaceæ 732
Urtikparim 593
Uruk-el-kafur 771
Usadhana 853
Usfandanun 646
Ushak 392
Ushar 513
Ushira 852
Ushit-tagarai 265
Ushnah 393, 864
Ushnan 653
Ussarah-i-rewand 83
Ustukhudus 618
Usturak 315
Utanjan 593
Utarni 523
Utingan 593
Utnen 418
Utran 523
Utrunj 135
Uttamani 523
Uzomut 816

Vacha 813
Vackelie 324
Vadakodi 592
Vadam-kottai 292

Vahisi 339
Vaivarang 471
Vajradanti 590
Vakeri-mul 251
Vakoochie 216
Vakuchi 421
Vakula 480
Vala *or* Wala 851
Valeriana Hardwickii 419
Valerianeæ 417
Valesulu 432
Vallai-naga 324
Vallarai 361
Valmilaku 724
Valuluvai 178
Valumbirikai 113
Vanaharidra 769
Vana-jai 598
Vanardraka 764
Vanari 229
Vanatiktika 23
Vanda Roxburghii 702
Vandukolli 266
Vanga-maram 547
Vansa-lochana 856
Varamulli 590
Vardhara 208
Varshiki 475
Vartalau 615
Vartangi 251
Varuna 63
Varunadya churna 63
,, guda 63
Vasaka 584
Vasakhepa 780
Vasakshepa 780
Vashanavi 1
Vashira 599
Vata 745
Vatari 704
Vateria indica 93
Vatsanabha 1, 6
Vattangi 251
Vattekku 251
Vavala 748
Vayavarna 62
Vavli 62
Vayu-vilangam 471
Vazhaip-pazham 777
Veddavala 281
Vekhand 813
Veldode 786
Velip-parutti 523
Vellai-maruda-maram 323
Vellai-goyya-pazham 334
Vellaip-polam 154
Vellarin 362
Vel-velam 281
Vendaikkay 103
Vendayam 209
Vengai-maram 239
Venivela 29
Veppalei 497
Veppam 168
Veratroylaconine 4
Verbenaceæ 595
Verk-kadalai 246
Vernonia anthelmintica 421
,, cinerea 423
Vervena capitata 599
Vettilei 727
Vetti-ver 851
Vibhitaki 320
Viburnic acid 603
Viburnin 603
Viburnum fœtidum 603
Vicia faba 291
Vidanga 471
Vidari 564
Vijapura 134
Vijaya 733
Vikunia 330
Vilam-pazham 142
Vilayati, *see* Wilayati
Vilva pazham 139
,, peshika 140

Vimba 351
Vimbu 168
Vinca pusilla 509
Vinchu 555
Violaceæ 65
Viola odorata 65
Violenic acid 66
Violin 66
Virana 852
Visalatvak 491
Viscum species 755
Visesh 148
Visha 1
Visha-mungil 820
Vishamushti 526
Vishatinduka 526
Vishnugandhi 564
Visnukranti 561
Vitex agnus castus 600
  „ Negundo 600
  „ trifolia 600
  „ species 602
Vitis adnata 183
  „ araneosa 186
  „ carnosa 183
  „ quadrangularis 182
  „ setosa 183
  „ vinifera 184
Voandzeia subterranea 247
Vodalai 281, 283
Vodolam 283
Vola 154
Volutarella divaricata 466
Votamba 749
Vriddhadaraka 566
Vrihati 637
Vrihat-pancha-mula 119
Vrihattvak 491
Vullerkoo 515
Vummaay 177

Wageti 65, 133
Waj 813
Wajrmut 816
Wakandi 521
Wakhma 9
  „ alkaloid of 10
Wakumbha 327
Wala 851
Wanapala 584
Wander bashing 863
  „ roti 463
War 745
Waras 544, 709
Ward 298
Warelu 851
Wariari 372
Wars 709
Wassanwel 32
Water chestnut 119
Water melon 350
Wa-upla-bij 343
Wedelia calendulacea 431
Weights, oriental 884
Wekaria 216
Wentwel 883
Weschak 393
White bachnab 3
  „ Behen 456
  „ dammer 93
  „ pepper 718
  „ Rhapontic 456
Wilayati-agti 266
  „ chambeli 324
  „ mehndi 335
  „ mung 246
  „ nim 171
  „ palwal 103
  „ saru 750
  „ zirah 367
Willow 731
Withania coagulans 645
  „ somnifera 643
Wizr 582
Wood apple 142
Woodfordia floribunda 306

Wormseed 438
Wormwood 435, 436
Woula 480
Wrightia tinctoria 500
Wrightine 499
Wushajj 393
Wushak 393

Xanthium Strumarium 458
Xanthopicrite 128
Xanthostrumarin 459
Xanthoxylene 128
Xanthoxylin 128
Xanthoxylum alatum 128
- ,, Budrunga 128
- ,, hastile 128
- ,, piperitum 128
- ,, Rhetsa 127
- ,, triphyllum 128
- ,, zeylanicum 128

Xyrideæ 818
Xyris indica 818

Yalki 325
Yamani 365
Yamani aloes 826
Yang-tsai 868
Yashtimadh 244
Yasmin 474
Yavasa-kara 218
Yavatikta 582
Yercum 515
Yercum-vayr 515
Yew 758
Yuthikaparni 589

Zaban-i-gungishk-i-talk 497
Zachun 147
Zadwar 11
Zaferan 796
Zakhmhyat 360
Zakhmi 191
Zakum 691
Zanjabil 762
Zanzibar Dragon's blood 811
Zapania-nodiflora 599
Zarawand-i-gird 680
- ,, Hindi 678
- ,, mudahraj 681
- ,, tawil 681

Zardak 380
Zard-chubah 765
Zarir 14
Zarishk 35
Zarnab 758
Zaru *or* Zarv 315, 485
Zarumbet 771
Zarumbad 771
Zarwa 486
Zatar 840
Zataria multiflora 617
Zea Mays 855
Zedoaire jaune 770
Zedoarin 772
Zedoary 770, 771
- ,, black 773

Zehneria umbellata 346
Zharas 75
Zinian 365
Zinziber Cassumunar 764
- ,, officinale 762

Zira 369
Zirah-i-Armani 367
- ,, Rumi 367

Zir-el-akhilleh 878
Zirki 559
Zizyphus jujuba 180
- ,, rugosa 181
- ,, vulgaris 180
- ,, zylopyra 181

Zufah-i-yabis 612
Zu khamsata aurak 600
Zygophylleæ 119
Zylobalsamum 164

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